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RELIGION AND SCIENCE

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RELIGION AND SCIENCE

SOME SUGGESTIONS FOR THE STUDY OF THE RELATIONS BETWEEN THEM

BY

P. N. WAGGETT, M.A.

OF THE SOCIETY OF S. JOHN THE EVANGELIST

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RELIGION and SCIENCE

ΠΙϹΤΕΙ ΝΟΟΥΜΕΝ
ΚΑΤΗΡΤΙϹΘΑΙ ΤΟΥϹ
ΑΙΩΝΑϹ ΡΗΜΑΤΙ
ΘΕΟΥ

PREFACE

I HOPE that the judicious readers of this book will say that it raises more questions than it settles. It is very difficult to know anything of Natural Science; very difficult to know anything of true Religion; most difficult to express one's sense of the relation between these two things, and not less difficult as they both grow to be matters of vital and constant interest. I have very few answers to give on the subject I have ventured to touch; would rather, by much, put new questions to such readers as I gain. In particular, I am convinced that the teachers of the nation and members of the clergy are quite ready to examine, and, if possible, to accept, the lessons of Natural Science and of Modern Thought; and that no harm would be done if the suggestion got abroad that scientific doctrine is complicated and hard to master; that different parts of it vary much in the scale of certainty; and that the bearing of it all upon religious faith and practice needs a much more critical examination than it has yet received, before it is made the occasion of 'reconstructions' or new statements of the doctrine drawn from Divine Revelation.

There are some who, in presence of the attacks of Naturalist-Agnosticism, are anxious to show just how much of that which is supposed to be essential to faith is really external to it if not actually alien from it.

Such a work may be very necessary; but one may doubt the wisdom of undertaking it in a moment or in a mood of anxiety. At such a time the enterprise will engage the energies of many very earnest Christians who, by the way, will differ widely among themselves about the exact extent of the matter to be dispensed with. But it will also attract the less discreet efforts of some who, under colour of lightening the ship, would cheerfully heave the passengers overboard. For we must not forget that if there are some believers who are distressed by the form of the Creed there are many more who are 'offended' by hearing it criticised; who are driven away by concessions.

Nor are we quite safe from the intrusion, at such a moment, of another class of reformers who find their opportunity to lessen faith in the very business of refuting some attacks upon it.

When these come on the scene of debate, it is as if spectators of a matron much buffeted by the wind should seize the occasion to make off with her cloak and umbrella. These are not part of her; but they are hers. And clothing also has its value.

There is no need for a hurry into certitudes of Modern Thought; and it may be the fact that in past discussions danger arose not from the raising of questions but from the swift provision of answers.

If we turn from controversy to the more attractive fields of pure Natural History, and the riches which apt analogy brings thence to popular religion, we of the clergy stand in no need of special encouragement.

At any rate the pastoral use of scientific topics should be founded upon a moderately laborious research. There are few things so perilous as knowledge lightly won; and this is particularly evident when Science in Sport is made Sermons in Earnest.

P. N. W.

WESTMINSTER, *Nov.* 6, 1903.

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CHAPTER I

THE PLAN OF THE BOOK

1. Having regard to the special destination of these books, I have found it impossible to include within the space at command any discussion of the difference or agreement between Natural Science and particular doctrines of revealed Religion. For example, I have not here attempted to write out my own answer to the alleged anti-theological effect of the modern doctrine of heredity or of the doctrine of development. The difficulty of reaching these and other special topics is a difficulty of space, and I am convinced that it cannot rightly be evaded by omitting those chapters with which I have in fact filled my pages, in view, as I have already said, of the fact that those pages are for the study of a learned body. In some other subjects it may be possible, it is possible, to set forth in brief form the main conclusions of the experts. We get, and we trust, such short tables of teaching about textual criticism. If we cannot touch the study of the process, it is still very valuable to know the results for the day, as they appear to a recognised group of scholars.

In such subjects, a handbook which is a handbook indeed may give in short compass a real introduction to wide regions of learning; and this work is especially successful in theology where learning is old and ripe, and where skill is trained in the strictest school. The manual is not the very fruit of research itself, but it is a genuine and honourable product of the schools of research, and has a definite part to play in introducing to the world the better things of which it constitutes a real report. It represents the effective charity of culture; and moreover, it can fitly be addressed by culture to culture, by culture in one field to an equal culture occupied in another.

This kind of work is not possible for Natural Science, and it is not possible for the study of the religious implications of Natural Science. There we find no authoritative set of conclusions to recite; and if failing this we look for an epitome of work, we are equally at a loss. It would be absurd to offer to the clergy or to those others whom we hope this book may reach, a brief and elliptical representation of arguments which are still in the making, which range for material over a great number of facts, and touch at every point problems of philosophy on the one hand, and of conduct on the other.

A bibliography of contentious science, or a bibliography of apologetics might be useful. But a bibliography is not a handbook; and moreover it should always be placed in the neighbourhood of a large and real discussion, or it may serve in some degree as a substitute for reading. I have seen no way myself but simply to go as far into my subject as space permits, saying but little indeed as it is, but yet a little more than would have been possible had I pushed on at whatever cost, to a review however slight, of all or most of the particular difficulties which I desire very much to treat some day on their merits and in a manner not too compressed for usefulness. We have here in fact only portions of an essay.

I am, I repeat, perfectly convinced that the preliminary considerations are *at present* of the most practical importance. We have a great number of books dealing in a polemical manner (taking truce as a part of the business of war, compromise as a branch of polemics) with naturalism in many forms. The materials, so to speak, for a party-fight are fairly ready to our hands. What is still to seek is a firm starting-ground, a just point of view, a clear conception of the kind of victory which we of the dogmatic side may fairly hope for or ought to desire. To gain such a point of departure is the best preparation for an impartial, because an unalarmed, study of the evidences and the pleadings.

2. We may try to distinguish a little more leisurely this preliminary inquiry from other

parts of the work. By so doing we give to our disclaimer of the thinnest completeness for the present book a little positive value of its own, and there will be opportunity—without the smallest approach to bibliography—to name a few useful books, and moreover to indicate for future effort some of the subjects which are unattempted here.

In our review of the ground we need hardly stop to say that the discussion of the scientific criticism of Religion will be valuable in proportion to men's *knowledge* of the contents of Science and Religion. The most knowing will be slowest to claim a competent or satisfactory knowledge in either field. Perhaps even the ideal preparation would not go beyond avoiding actual error and recognising the close limits of certainty.

We may, with more point, add that the inquiry will contain questions of three kinds, and that to distinguish these kinds and treat them separately, will be an advance of real moment.

The three kinds of questions are: first, those which are interior to Science itself; secondly, those which concern the direct theological effect of a given scientific conception; and, thirdly, the deeper inquiries as to the extent to which Religion is dependent upon the character of such direct effects.

(i.) The first kind may be illustrated in biology by famous examples. There are the questions of the sufficiency of Natural Selection for the origin of species, or, if not of species, of adaptations; the question, contributory to the above, of the direct effect of the environment, of use and disuse; of the inheritance of acquired characters; of the nature and time-rate of geological changes; of the machinery of variation; of the origination of habit, of instinct. All these, too apt to be introduced while still *sub judice* into the midst of apologetic discussion, form a class apart—the domestic debates of biology itself.

Out of the great multitude of books the following may safely be recommended as sources of light upon biology itself to those who have not made it a special study. The works of Darwin are, of course, of the greatest advantage to those who have leisure for them. A completely admirable account of his teaching is found in Romanes' *Darwin, and After Darwin.* This book is the work of one who at the same time was an original worker of the highest distinction, and also possessed a quite extraordinary measure of knowledge of the *whole* field concerned. The third volume remains the most valuable review we have of the discussions which have *followed* the establishment for a great many naturalists of Darwin's principal conceptions.

As we name Darwin's works so we name those of Weismann as of the highest original importance. A short book by Mr. Platt Ball,[1] though published some years ago, still gives a most valuable review of one of the questions which divide evolutionists between what may be called the school of Weismann, and the school of Eimer and Semper. On the anti-Darwinian or non-ultra-Darwinian side there is still a considerable body of teachers, and Romanes himself has represented what is strong in their case with great justice and skill in his *Examination of Weismannism.*

With regard to variation Mr. Bateson's book is most profitable; and still more valuable, he would himself say, are his edition and explanation of the work of the Abbot Mendel. For knowledge of the wonderful structures and processes concerned in these inquiries one may point with security to Wilson's *The Cell in Development.*

But the temptation to pass from one delightful volume to another must here be resisted. Perhaps if only *one* book not exactly of the school of Darwin were to be read by a layman in biology it should be Semper's *Animal Life.* The study of such a book, though it is no longer new, will act as a balance and a warning when, as is most natural, one is inclined to believe that Darwin has left nothing to be discovered or discussed.

It is perhaps proper to mention that Mr.

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[1] *The Effects of Use and Disuse.*

Herbert Spencer is not, for non-naturalists, a safe guide, because he differs profoundly from the teachers of the main stream in respect of the non-selection elements of adaptation; and because, moreover, he does not show in his books or his occasional contributions to the discussion, so great a power as we expect in him of appreciating the force of arguments and evidence urged against his own view. It must indeed, in all frankness, be admitted that where he touches biology this is a grave source of weakness, and must occasionally give rise to a doubt of his guidance in regions which are less within our power of criticism.

To another famous name, that of Haeckel, one is obliged to make the same note. Haeckel is undoubtedly a naturalist of very high rank, but he as well as Spencer, in the matter of the inheritance of acquired characters, is dogmatically opposed to the prevailing view, and therefore is not a safe guide for the purpose alone regarded under the present head, which is that of discussions within biology, however great his contributions may be to theology. For naturalists his plea in natural history will be of value: to non-naturalists it may give an erroneous impression of the prevailing state of scientific opinion. We may return to the matter here referred to as it affects inquiries of a different kind. Probably the most distinguished English exponents of 'Darwinism' in its exclusive form (something different from biological doctrine as Darwin left it) are Professor Ray Lankester and Professor Poulton. The works of Huxley, if they could be read without theological prepossessions, would be of the greatest help for the understanding of the merits of many purely biological questions. But it is practically impossible to use them under what we have chosen as our first head. Alfred Russell Wallace's original works are so great that one hesitates to name him as an epitomiser of that doctrine of Natural Selection which he conceived independently of Darwin. The book which with characteristic gallantry of unselfishness he calls *Darwinism* is nevertheless of the highest interest as an exposition, though at this moment it may possibly be thought to represent too slightly the facts which point to the discontinuity of variation.

(ii.) The second kind of questions are those in which conceptions, regarded as established for science, are brought to bear upon general thought, upon the theory or conduct of life; and, progressively, upon the course of philosophy, upon abstract theism, upon religious belief. The difficulty of naming any books, out of the many which do not cease to appear upon these subjects, is extreme. Many are famous. One may be mentioned which, by its size though not its merit, might escape notice—Hutton's *Lesson of Evolution*, for the general result upon thought of scientific conclusions. Croll's *Basis of Evolution* is very important. Fiske's works and the works of Leconte are strong and good. To name others out of the great number of able writers would be misleading. Huxley may here stand as the great representative of true Agnosticism. Ward's *Naturalism and Agnosticism* must be, for years to come, the classic of the criticism of the Agnostic position, the storehouse of polemical writers.

But the naming of books is not the primary purpose of this chapter.[1] What it is to plead for is the recognition of the line between biological inquiries as such, and their implications for general thought; to plead that in treatment this distinction should be as far as possible preserved.

(iii.) Thirdly, if the questioning of the general outcome of scientific thought rests on the one hand on a questioning purely scientific (in our instance biological), it has relations on the other hand with an inquiry still broader than itself. If we are to ask whether Natural Selection defeats the argument from design, we must first ask what would constitute such a defeat.[2]

There is need, that is to say, of a discussion of the nature of conviction itself, of the degree in which it can survive difficulty, of the measure of its need of immediate satisfactions. If, as is surely plain, we cannot well work at questions of material fact without putting on one side these supposed implications, so we cannot so much as discuss the relations of a given religious belief with a given scientific theory, unless we have pondered over the conditions under which alone they can with any measure of usefulness be brought into conflict or contrast. If our second group of questions is that which sets definite and particular theories face to face, our third (in the present order of enumeration) is that which contains general discussions of the nature of religious and ‘natural’ fact, of religious and scientific convictions in themselves.

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[1] Full references to the books here named and some others will be found in Appendix B, p. 165.

[2] If one book only is named in this connection, it must be Romanes' *Thoughts on Religion*. (Longmans.)

And the opinion which rules this little book, once more repeated, is that we are obliged to undertake in some slight way the larger work before we touch any of those special ‘difficulties’ which a careful observation of the field of debate enables us to set in order.

To a judgement of the conditions of useful debate, an opinion of the actual state of men's minds is contributory; and we commence, therefore, with some suggestions on this head.

I have yielded to the desire to include some reference to the *practical* problems imposed by scientific argument upon religion. Without this reference we should have been out of touch with controversy in its *actual* strength. We have, in point of fact, passed from questions speculative concerning the origin of man to questions political and social concerning his present management. Here also many make a supreme and exclusive claim for Natural Science. Our book therefore just touches the ever-increasing modern study of Heredity, and the naturalistic view of the origin, the interests, the future and the proper management of society. Considerations of heredity seem to clash with the authority of Ethics, with the free endeavour of the individual to reach his best. Considerations of organic development, and especially of Natural Selection, seem at least to compete with the old ideals of social enterprise, to point out a path of progress very different from that which mankind has hoped to follow under the guidance of mercy and with the courage of faith. These conflicts are actual and likely to grow in importance, and accordingly some suggestions preliminary to their treatment close our book.

P.S.—The close of Mr. Herbert Spencer's most laborious and honourable life came while these pages were passing through the press.

CHAPTER II

THE POSITION

The first task of one who addresses himself to the speculative difficulties which confront religion from the side of Natural Science is to show that such difficulties exist.

1. There are regions, or at least there is a region, in the intellectual world where they are in a marked degree quiescent. Some of us are so much taken up with new Psychologies, the Subliminal Self (lately showing signs of kinship with that other mystery the Transcendental Ego), with all kinds of easy mysticisms and non-Christian illuminations, that scientific materialism seems the last thing we need provide against. We are content with the very practical materialism of greed and haste; but for guidance in speculation we have turned to fancy. And the products of fancy are collected and tabulated and made the 'basis' of this and that, till one longs for a little hard-headed 'unbelief,' to be a pagan suckled in the outworn creed of open-eyed physiology, if only we might escape for an hour from wizardry that peeps and mutters.

There might well, then, seem no sense in paying the compliment of attention, still less of resistance, to the popularly discarded theories of naturalism. Men have, to speak quite frankly, grown weary of the unfulfilled threatenings of materialism; and, along with materialism in general, that natural science which it claimed as an ally has fallen into a sort of harmlessness. The very extravagance of the negations required of us has recoiled upon the assailant and tends to discredit the base from which he advanced. If it is true, men said, and some of the scientists insist that it is true, that modern physiology (in the academic sense[1]) requires the abandonment of religion, metaphysics, tradition, even manners, why, what a very bad coarse thing physiology must be; let us hear no more about it. For whatever else is important, of the importance of tradition, of metaphysics, and of religion we are at least sure. The naturalistic attack, in fact, somewhat overshot its mark. Like democracy it demanded too much of human nature, and must needs modify its claim or sink out of fashion. Society and learning and affection will not go on for an indefinite time in the attitude of a householder with the burglar's pistol at his ear. If the world has rebelled against the morphologists it is the morphologists' own fault. For it was they, not we of the general public; it was they, or at least their cleverest representative, Huxley, that sincere but perverse thinker, who insisted that the advance of science must be over the graves of our most intimate convictions. We who love science resent immensely this way of putting the affair, but we have to admit that it was by those who led us in morphology that the clergy and society were taught to tremble.

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[1] Physiology in the old and in the academic sense means the study of material nature. In a second and more limited use it means the study of organic nature; and in the modern use of science it means the study of function as distinguished from the study of structure. The latter is called morphology.

Zoology comprises the physiology and morphology of animals; and botany the physiology and morphology of plants, with, in each case, other departmental or subsidiary studies.

In the 'middle distance,' so to speak, of English and French usage, *e.g.*, in Pascal or in Cavendish, the word Philosophy had often very much the sense we now give to science; and this sense is reflected in the name Natural Philosophy, then given to physics. The word Science retained a wide and high meaning so as to include Theology in the fullest sense; and if the study of phenomena was to be indicated, it was always, and officially down to our own day, called *Natural* Science. At present, constant use justifies us in calling metaphysics philosophy, and Natural Science simply 'Science'—too happy if the word is not made to mean the special contentions of some materialist system.

Pressed home as an assault upon religion, the advance was bound to fail. The ship of scientific philosophy was, so to speak, steered straight for the rock of the surest human convictions; and when we were asked to give up, for the sake of society's latest object-lesson, that which is the foundation of society itself, we naturally—though I admit, and urge, lamentably — felt that we should prefer to dispense with the object-lesson.

The consequence for many minds is that at the present moment natural science has slipped back into the place it held before Darwin. It is free to catalogue facts and to collect materials for a larger catalogue. But it exercises only a moderate influence on current speculation, and is kept at arm's length by the actually formidable enemy of wise religion.

2. For what is the actual enemy? To the present writer the answer is plain. The undying enemy of religion and hope presents himself to-day not in the respectable form of rationalistic doubt, of naturalistic common sense, but in the wavering outline of an extravagant eclecticism. The revolt against scientific tyranny began in 'Society.' There at least men were determined to be allowed to believe if they liked. But the revolt was disorderly; it never became a revolution. There is no provisional government even; and the consequence is that, the terror of Mr. Huxley once withdrawn, we have thought ourselves free to believe anything and everything, often several faiths at once which are mutually exclusive. It seems to be supposed that logic has gone, that we had to say good-bye to logic in order to free ourselves of the nightmare of materialism.

Now this wild readiness to accept the most opposite statements and proposals does not mean freedom; it does not mean speed. It means, indeed, the renewed claim of the human consciousness to have some share in deciding its own beliefs, and so far it is good. The patient has got his head free from the grip of the dentist's chair. But with the freedom has come a rejection of all *leadership*.

Rationalism denied the prerogative of the soul. Eclecticism, acknowledging the soul, denies the unique claim of Christ; and rejecting this leadership, finds the direction and the pace of the spiritual adventure set by the most erratic and consequently slowest professors of the Silly Life.

There are regions, then, where the solemn menace of scientific materialism is unfelt; and we do not disguise the conviction that there is at least as much loss as gain in the change implied in that.

We are in danger of exchanging one scepticism for another, of learning to rebut the contempt of the materialists for the soul's witness, by a contempt of experience in general, a *laisser aller* in respect of Truth itself.

3. Again, there are graver circles in which the opposing difficulties on either side have been so great and so nearly equal that men have tacitly divided themselves into mutually respecting camps; and there is a kind of truce between the camps. A truce is it?—or is it that our respective weapons cannot reach in either case the opposing force? We are immune to the

poison of each other's doubts, untouched by the splendour of each other's truths. We are as separate almost as the Catholic provincials and the barbaric Arians of a Frankish kingdom of the sixth century. Each side recognises that there is a strange kind of solidity in the achievements of the other, but renders thanks to a kind influence which has made men's tastes so diverse that even in truths and agnosticisms there is enough for all without any gross competition for the same mental meats.

The clergy, of course, are different. They labour day by day to fit their sermons to the requirements of 'Modern Thought.' They absorb the latest news, and they are ready now as always to do more than justice to the most revolutionary Galileo, finding a place for his novelties between the lines of catechism and creed.

But up there on the academic hills, in the rare atmosphere of choice research, surely it is not too much to say that the independent bands which make up the slender army of thinkers go upon diverse ways rejoicing in their inability to comprehend each other's aims.

There is much that is admirable in this mutual detachment; and yet, it must surely be preparing a day of danger when, after long and peaceful estrangement, the science which shall have absorbed the last tribute wrung from popular belief will turn upon culture and shout for hostages in a more than ever unknown tongue.

The theologians continue to elaborate theology, while the 'naturalists' believe that there is no such thing. Meantime the scientific men increase their stock of fact and theory, while the theologians regard the naturalists' mystery with eyes sometimes of innocent credulity, and sometimes of undiscriminating weariness.

4. Elsewhere an attempt may be made to show how in other quarters the purely speculative debates have been put aside, not by an unworthy indifference, but by the superior attraction of questions affecting practice. It is enough at present to say that both for these and for other obscurer reasons—very largely, no doubt, because so much has been yielded on all sides to the demands of 'evolution'—there is, within the regions of high education, an observable decrease in the attention paid to questions of origin, the animal nature of man, the non-theistic interpretation of adaptations, even the medico-materialistic version of psychological events.

5. But—and here is the question for men of practice—is this change a change which prevails over the whole field, we will not say of thinkers, but of talkers? Does it even affect a large part of that field as measured by the number of disputants and doubters? We think not. Remem-

ber that for all our pre-occupation with slighter thoughts, there exists a body of men, a large body of serious men, the ablest and not the least disinterested and strenuous of our time, for whom Natural Science is all in all. These men, when they see us happy in an easy scorn of 'materialism,' when they see us 'in tune with the Infinite' and riding free of facts, simply conclude that religion and idealism in general have given up the race. With the grave courtesy which serious studies foster, they turn to their special tasks; they no longer so much as criticise the statements of religion; and the tragic breach between those strong souls and the men who try to pray becomes deeper just because it is forgotten.

This peaceful alienation is a far worse state than the state of weekly conflict in which the Professors threw themselves joyously upon the shouting ranks of the Preachers. Give us back the days of Huxley, the days of Gladstone and the Duke; give us the narrowest issues fought in the narrowest way; anything rather than this cold separation among the men who think, always when taken all together—theists and agnostics, mystics and physicists—a slender enough band in the great mass of buyers and sellers, the makers of fortunes and the spenders thereof.

6. But, if we put aside the leading minds, even in popular thought there are great inequalities

and discords. The spirit of the age does not move all in a piece. What is old in one quarter is in another quarter just arriving.[1] Controversial weather is a matter of latitude. It is a matter of altitude. While the mists have lifted from the high fields they lie thick in the valleys sometimes; sometimes the contrast needs to be stated in the opposite way. In provincial towns, in training colleges, among the highly intelligent but scantily informed scholars of our state schools, among men who have turned late in life from the pasturing of souls to the construction of books, in all ranks of the great nation which has lately learned to love reading, there is widespread unrest on the old 'Darwinian' grounds. The very possibility of buying—the possibility, say rather, of selling—Darwin for a shilling and Laing for sixpence, marks the truth of this statement. You have a whole new generation experiencing the thrill which Darwin's own generation experienced—the thrill of thinking, and that in a new language, and about a new set of facts.

Men are now introduced to the entrancing employment of speculation who were formerly excluded by lack of the tradition of it. It is as if a schoolboy could play polo, or a clergyman compete with merchants in the patronage of art.

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[1] Somewhere in Kaffraria—I think near the Basutoland border—I heard of a native chief who was 'giving trouble' to his lately trusted missionary on grounds discerned in *The Descent of Man*.

New and wonderfully fertile regions of intellectual activity have been opened up even by our very partial public education. And in these, there are quarters where the problems of Genesis and Geology are the pressing troublers of spiritual peace and spiritual enterprise. That old blunderbuss which we thought had for ever missed fire, fetched down in antic mood from over the hearth, goes off at last in a tragic manner; goes off in the hands of a generation which did not see it loaded.

And the excitement falls as a grievous burden on many simple earnest souls, who ask with justice how it is that their elders in this strife managed to weather it. They ask whether the questions are less serious than they seem; whether it is possible to answer them; whether Christianity has been able to absorb the new knowledge; whether tradition could afford the necessary concessions; what has been *done* with the fears and the doubts. Where are they stowed away, these disquieting facts, in the Christians, accomplished, knowing, honest, whom they, the new debaters, see so calmly pursuing their way to ever fresh tournaments of ceremonial research, ever fresh civilities to superstition, to sentiment, to the world?

The difficulties of the 'Origin' class, the questions of how men came to have minds, of how the case stands with the Bible, of whether prayer is right, these and the like are not prominent in public discussion, but they exercise a formidable influence in many silent social levels, for they lessen the *general* confidence in Religion, and, worst of all, they have actual force to check the spiritual adventure of innumerable souls, that practical adventure which can alone secure the prize of conviction.

There are certainly, besides all difficulties, many great advantages for religion and for hope, which come from the side of natural knowledge. To many, almost every advance, every item of news from the splendid fields of scientific work, seems quite full of encouragement, of wonderful lights, of widened access to a lasting truth. Analogy alone, how richly it is continually assisted by the new penetrations of inquiry. What can be more stimulating than the increase, so great for all its bewilderment, of the knowledge of heredity? What can so abash the very temper of irreverence, what can so confirm piety in its instructive confidence in a supreme and almighty Guidance?

Or, again, how can we measure the assistance to thought in every department which arises from the study of the conditions of life in itself? How full of philosophic import is its unerring correlation. How destructive of false and artificial exclusions is its balanced interdependence. How hopeful is the spectacle of its close-knit circle of change daily better understood—the circle within the organism, the circle of organisms which girdles the world, bringing fruitfulness out of death, rendering perpetually into effective currency the ever-flying, never-escaping captive of organic wealth.[1]

Or, again, as thought gropes after a definition of the individual, how illuminating is the study of those lower organisms—lower but exquisite in their perfect harmony of life—in which the colony is seen passing into the individual state and the conjoined cell becomes a co-operative member of the newly distinguished whole.[2]

There are encouragements enough from the side of science, light enough, wonder enough, to be the food of a hungrier faith than ours.

But meanwhile what of the *difficulties?*

How can we pass them by? Are we to ignore them? How can they be anything but the first and last object of our alarmed gaze? How did you and others, say the younger brothers, how did you manage them? How do you enjoy—we do not say your faith—but your religion so comfortably, with these horrors of contradiction waiting always on the threshold? Tell us, can they be dislodged? Or is there, as the American officer said at Colenso, a way round?

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[1] On the Nitrogen-capturing Bacteria a Note will be found in Appendix A, p. 163.

[2] It is, perhaps, among the cœlenterata that this perplexing but illuminating origin of the 'larger individual' can best be studied.

It would be delightful indeed if we could give satisfaction in such a case, so that the spiritual adventure might run free, so that the disclosure which waits for the spirit might make its accost, so that the natural intelligence also might look with courage on the mixed scene of life. How happy, that is to say, if not only men's religion but men's science might move more freely by the removal of these now ancient doubts. For indeed Science quite as much as Religion has been hindered by the supposed conflict.

What can be done?

This at least; we can refuse to lament because the explanation is incomplete. We can suggest the grounds for patience. And accordingly, even if we do not attempt to show in what manner, as we suppose, some of the difficulties may be met, let us, to start with, endeavour to represent the lawful state of a man with respect to those difficulties which as yet he can neither dissolve nor circumvent.

There are difficulties which are difficulties indeed. What of these? Do they shut us up in inaction? Is there some large view in the scale of which they appear as incidents to be borne with in good courage? Of difficulties as such, insoluble difficulties for the present, let us first speak. And provisionally let us make the most of the difficulties; take the extreme view of the scientific certainty of those conceptions which are supposed to be inconsistent with faith.

CHAPTER III

THE PLACE OF DIFFICULTIES IN THOUGHT

No sure advance will be made by any man who supposes that in thought any more than in life we can hope to escape difficulty. By difficulty we do not mean perplexity only, but actual pressure. There are conclusions which are to be dissolved and conclusions which are to be avoided; but there are also conclusions which have to be resisted, held at bay, 'held up' I think some adventurous Western people call it, until we can see our way to destroy them. Such a resistance is not irrational. It is an appeal to the deepest and surest reasonable convictions, against a reasoning which for the time and *on its own premisses* has apparently won the day. The resistance may be undertaken without prejudice to truth, for it can only be successful if our appeal is substantially just. There is no danger of delaying the march of truth by a factious opposition within our own breasts. But there is very real danger of letting slip some true word, some conclusion secured by ancient experience, if we part with a statement at the first moment in which we do not ourselves see how it is to be maintained. For indeed resistance goes to the true setting of the problem; and in a world where truth is not continuous, where two just propositions lie side by side in the world of mind without evident co-ordination, no one can tell what reason really requires unless he contributes to the interior discussion a genuine will to hold fast what he has received, what he knows. There must be a clash of opposing beliefs—yes, even in a man's own mind.

It is true of thought as of life. Life, while it is indeed a correspondence with other forces, is at the same time and most deeply a resistance maintained against them. The continuance of life is the continuance of a struggle, a refusal, a claim made good at expense of effort, by the breaking down of dead forms, by the perpetually renewed escape from a degradation in the series of molecular complexity. Life is the refusal of intimate motions to become merely heat, merely light, merely electric thrill. And just so soon as this refusal ceases, ceases life. The moment of life's ending is precisely the moment when the body which once lived begins to follow unchecked the law of merely physical determination, so that, now as never before, we can predict its course of change by the record of matter under heat, chemical reaction, and so forth.

Life appears, indeed, *in the midst of* the movements of which Physics takes account; its movement, as a whole, may be analysed with various degrees of success into terms of Physics. But the *existence* of the movement, though it uses the laws with which Physics deals, is not accounted for by them. It is an elastic recoil from them, a continuous strain by which matter is lifted in some real sense above them.

Life, then, while it is a close correspondence, the closest and most wonderful within the field of sense, with all the other movements and realities of the world, is, at the same time, a resistance to them. It corresponds, but it corresponds in lifting; as the power corresponds to the work it does.

And thought in the same way, while it is a closer correspondence than any within the field of sense, while it is perhaps nothing without the object it relates, is nevertheless a straining against influences which tend by themselves to bring it to nothing. Apart from all question of its translation into action, thought itself is the lifting of a weight, not the mere balancing of a weight; it is the transformation of energies, not their simple resultant. The soul finds itself groaning all its life long under the pressure of an experience contrary to the soul's central interest; finding indeed there the promotion of its true good, but finding it in a continued endeavour, and in the reassertion of a certain inward law of growth in face of forces dragging towards a dead level.

The essential and unavoidable conflict for thought could not, as it seems to me, be better expressed than in words from a private letter of Sir William Herschel:—

> "I feel, perhaps with more consciousness than many others, the tremendous, the almost infinite, pressure of the external world of matter and of history and of the fellow beings of the hour, upon the soft tissues of my own spirit."

There are, it is most true, many degrees in the consciousness of this pressure, not only in different men but in the same man at different times. We are not happy, utterly and truly happy, in the proportion in which we lose sensitiveness to this pain and seem to be sheltered from the weight of this invasion. Nor are those souls nearest to the security of faith which have never known, or know no longer, the burden of this unintelligible world. There are indeed few things more forbidding even for others, few things less favourable to sweet and live religion, than that bourgeois certainty with which the encased soul deals, as if by an algebra of name and figure, with awful realities. And perhaps few lives do so much for the lasting interests of faith,—none indeed except the pure souls which live with God in the unclouded intimacy of holy simplicity,—as the brave and open lives of men who proclaim doubt where others keep silence, proclaim it because they have so high an ideal of spiritual vision, so inextinguishable and so constant a hunger for the eternal.

Mental life, then, can only be maintained by a constant struggle. And it is a struggle not only against our own ignorance, against the stubbornness of the material we have to explore. It is not a labour only but a contest. It has to deal not only with darkness but with the perplexities of light itself. There are parallel or divergent streams of information which cannot at a given moment be harmonised; and under the strain which is thus produced the mind is tempted to one of two courses.

It is tempted to abandon altogether one element of knowledge in order to hold the other in evident consistency: or else it is tempted to conclude that knowledge itself is impossible, and to abandon, along with the certainty of spiritual intuition, the certainty also of material experiment. Of this sceptical temper there are endless variants which it is impossible in this place to trace.

What we believe to be the juster, indeed the only just, temper in view of the discrepancies and the discontinuities of knowledge, is one which recognises the necessity of divergence, *the case being what it is;* which is determined to hold fast to whatever commends itself on either side of every such divergence, to hold fast with an assurance measured by the kind and degree of probability which has been attained.

But the temper which thus *acknowledges* divergence is not *satisfied* with it; nor does it suppose a final harmony impossible. It only recognises the necessity of present divergence on account of circumstances which may be to some extent defined, and it hopes for the progressive attainment of a point of view in which the diverse sides shall be subsumed under a larger unity. I say attainment; for it is in the right use of faculties and opportunities, giving to both these words their fullest meaning,[1] that the acquisition of light depends. And further still, the right use of the will promotes not only the incoming of right light upon the existing conditions, but *it may well be numbered among those processes by which a new and clearer condition is to be actually introduced.*

It is not at this point convenient to enumerate any of the particular points in which Natural Science is held to lie in contradiction to Christian Faith. If a mere selection of them can be accepted, the reader will find it in Chapter IV. At present I am anxious to complete this sketch of the temper in which they ought, as I believe, in general to be faced.

Can we then ignore the teaching drawn from nature as if moving in a wholly different plane from the truths of religion? Or can we oppose to its claims a dogmatic contradiction on the ground that religious tradition is true, and what conflicts with it is therefore false? It may at this moment seem unnecessary to discuss such a method at all; but it was not so very long ago almost prevalent, and it is still used by Christians to Christians, as being sufficient for Christians as such.

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[1] Including under the name 'faculties' that of faith; and under the name 'opportunity,' the opportunity given in grace and in revelation.

Shall we, moving in an entirely different direction, endeavour to remove the scientific difficulty within Religion,[1] by a detailed conciliation of tradition with Natural Science; if possible by the multiplication of points of coincidence, but, if necessary, by the abandonment on the part of Religion of points of contradiction?

Reasons will appear below against this as well as against the earlier plan. In this place it will be sufficient to have stated the question. Somewhat apart from all such methods of detailed conciliation with science or of detailed repudiation of its claim, lie two great and serious efforts of the best minds for the true defence of man's spiritual inheritance. Of these the first is the attempt, not to conciliate Religion and Science as existing opposites, but to found or refound Religion upon natural knowledge, or at least to restate it in the terms of that knowledge. The other is the effort to maintain Religion by asserting the complete superiority of the inward verities over the 'facts' of outward existence which are supposed to override it.

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[1] There is a scientific difficulty in the field of Religion just as there is a religious difficulty in the field of education.

The first is a religious positivism, the second is the reassertion of idealism.

The first is, as it were, the reconstruction of faith by means of material evidence; the second is the perfectly just reduction of material evidence to its secondary place.

1. Each has great merits. The first brings many gains; the second is absolutely required for true progress. But neither the one nor the other can avail immediately for the succour of a faith actually beset by the perplexities with which we are concerned. The first must of necessity be only slightly touched in this book (chap. viii.); and the more safely since its friends are many and influential.

2. The idealistic cure for materialism as such is of the greatest importance for us all. It is indeed the root of all good. In the prosperity of this lies the hidden source of mental soundness. But, we repeat, it cannot immediately succour the special soul we have in view. Not immediately, not decisively, not even definitely. Indefinitely and unsuspected, it still does much for the most hardened—say, rather, the most enslaved—materialist. Most wholesome is a breath of that highly generalised Oxford thought which takes an or-

ganic evolution in its sober stride ; which knows no lively expectations of particular discovery, no keen alarm from particular negations.

But the idealist critique cannot by itself meet our case,[1] the case of Religion both popular and learned in difficulties with modern thought ; and its insufficiency is apparent in two ways. It is insufficient practically because not all men, or even all Christians, are philosophers ; and if it is urged, as it ought to be urged, that without any technical knowledge a man may yet possess implicitly all that desire to examine his own thoughts which is the substance of true philosophy ; yet, even so, and allowing for the great army of unconscious Berkeleys, there is also the great army of rather less unconscious Humes. It is precisely these to whom the disproof of Religion from phenomena appeals.

It is the manifold and not the One to which at present they instinctively turn for the confirmation of all conjectures, for the credentials of every belief. Consequently the idealist critique of materialism, the idealistic reassurance of faith must practically leave untouched the very souls which are chiefly checked by scientific difficulties.

Metaphysic can hardly be of use in reassuring the man who, without ranging himself under any philosophical name, is yet practically enslaved by the materialistic paradox; believes himself to have no faculty of belief, and thinks that there is no real meaning in the expression 'thought.' Will not metaphysic leave this man where he is? The springs of controversy have been poisoned for him. He is in a nightmare of fallacious reasoning. Chimeras are realities to him, and reality, which it is the business of metaphysics to disclose, has no substance in his eyes. Theoretically the condition of his error renders succour impossible along the line of a criticism of that which alone he dignifies by the name of experience. To appeal from what he calls 'facts' is impossible. For he has taken outward physical actuality as the type and norm of reality, and holds that knowledge finds its fountain and model and valid criterion in that form of quasi-knowledge which is supposed to arise directly from the aggregation of sense-impressions. The materialist has made a whimsical choice of standards: he reserves the word 'real' for a cheese or the smell of it, and refuses it to love or the return of love, at least when that love is a relation to God. But we shall ill promote the project of converting him by betraying our sense of his eccentricity. The idealist cure is *practically* inapplicable to the very cases where it seems most needed.

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[1] Certain special disadvantages found *at the present moment* in employing the Idealist argument are noticed in a separate chapter (chap. vii. p. 66).

Nor does the practical insufficiency stand alone.

Idealism is also insufficient by itself on rational grounds. For the fact is that religion is not concerned only with the abstract or with the general. It is concerned with the manifold also in respect of particulars. It is empirical. It is committed to certain statements—not so many as is sometimes supposed—but to certain statements about outward and observable fact; and it is precisely with regard to these that it comes into collision with what claims to be the scientific temper. Naturalism would be content to leave Religion undisturbed in the regions of mystery. Faith might be impregnable in the air, and float securely in a plane removed from all possible contact with particular experience. But with such a cloud-kingdom Religion is not content;[1] nor will it be satisfied with the last word concerning the uttermost origin, the ultimate significance of all things taken together. On the contrary, it points to *differences* of significance in the things themselves, and, worse still, it has its dynamic distinctions. It commands action. It declares that this is the way, and that no way. It expects from the unseen world supplies which make a difference in that sphere of conduct which cannot but be concerned with the sphere of sense. It has not only a history—which alone would remove it from the realm of pure abstraction; it has, further, a policy. And the grounds of this policy are based avowedly upon the recognition of momentous purposes which touch our doings, and of actions to be done by us, and experiences to be submitted to by us, in order to the accomplishment of an end which is not abstract and inevitable but particular and desirable.

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[1] On the effort to shut out faith from the consideration of physical facts see an article by the Duke of Northumberland on Religion and Physical Science in *The Nineteenth Century and After*, December 1902. Tyndall's declaration (approved by Professor Dewar at Belfast) on behalf of men of science, that "we claim, and we shall wrest from theology the entire domain of cosmology," means really, says the duke, that the world which is "the most striking revelation of Himself which God has given to man is no part of that science which deals with His nature and attributes."

Religion has too large a particular phenomenal element to be defended by a theory which rejects as unworthy of belief the exceptional *manifestation* of an Ideal which cannot itself be exceptional.

The true cure of religious doubt *for the positive mind*—and it is this mind which we all along consider—lies in the positive or scientific treatment and pursuit of Religion itself. To the further discussion of this treatment we hope to return at leisure. In this place it must be enough to distinguish it from what we have already spoken of as the founding of Religion upon Natural Science. It is not the religious interpretation—or at any rate not merely the religious interpretation—of the facts collected by physics, but it is the pursuit, collection, enjoyment of those spiritual facts, those special but growingly diffused and more penetrating experiences, by which the soul's own life and activity are verified.

This positive pursuit of the facts of spirit must be maintained in spite of difficulties. It must be maintained in spite of outstanding discrepancies with science, just as biological inquiry is pursued in spite of outstanding discrepancies with geology.

It must be undertaken along with the maintenance of the true idealistic general interpretation of all experience.

Now the true difficulty is the difficulty of giving this search a fair start. It is hindered by the doubts which it would in time dissolve; somewhat as Columbus, or almost any great discoverer, was checked from the beginning of his enterprise by those whom the success of his enterprise was to confute.

In order to make room for this positive adventure we have to consider (as we have already attempted) the general importance of all difficulties as such. We have in fact to renew Butler's plea that the difficulties of Religion are no proof of its falseness; we have to recognise that the witness of the spirit must maintain itself not occasionally but *always* against the almost irresistible pressure of sense. It is further necessary to define more clearly the necessary limitation of the authority of all science as such; but this great task is not attempted here.

It is enough if we can only suggest the temper of a belief which does not depend upon the denial of lower but still real forms of knowledge. Indeed it is impossible to overestimate the value of an inclusive view and of a patient temper. For if a sound and patient view can be reached, the gain, we have already said, will not be the gain of Religion alone. Science quite as much as Religion has been put at a disadvantage by the hostility to Religion which some men have endeavoured to fix upon it. On the one hand it has, in these quarters, been exhibited as moving towards collision with the deepest interests of man—the interests at once most far-reaching and permanent and also most intimately operative in his practical concerns. And moreover it has by this same suggestion of hostility been diverted from its own true path by the supposed importance of establishing certain theological victories. In this way a religious question has been intruded into Science just as mischievously as a scientific question has been intruded into Religion.

And yet further, if a patient attitude of mind is established, we are enabled to see the high degree of parallelism which exists between the procedure of science and that of faith.

It is this general parallelism which constitutes our important advantage, much more than any particular analogies or coincidences between religious tradition and the results of modern inquiry. Such general parallelisms are to be found in the place held by experiment in Religion, the place held by authority in investigation; the existence in Science quite as much as in Religion of the great power of general impressions and cumulative causes of conviction.[1]

The subject of methods of discussion cannot yet be dismissed. But before persevering with it, we may pause for the recognition of some of the special regions in which Natural Science has been thought to create difficulties for Christianity.

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[1] I may be permitted to refer for some development of these points to a volume of addresses called *The Scientific Temper in Religion* (Longmans).

CHAPTER IV

SOME PARTICULAR DIFFICULTIES

If we here mention some of the many particular subjects which are not touched in this book, this is not in order to make an apology for the residue which the book contains, but in order to suggest future work upon popular lines.

To take needs first, we need a bibliography of works on the 'Science and Religion' debate, and it must be a critical bibliography.

We need from time to time fresh reviews of the actual position of Science, made *sans parti pris* in the above-mentioned debate. We need, in this scientific age, a much more widespread knowledge among educated men of the general principles of Science, and, in cases, of some of its actual achievements. Karl Pearson's *Grammar of Science* is a great book, and, while not without controversial tendency, is of the highest importance for instruction.

We need a history of biological theory, on the lines of Carus' *Geschichte*, but more complete.

Romanes' Rosebery Lectures on the writers *before* Darwin would be of great value.[1]

Then, to turn to difficulties, points of collision, and points at which Religion may be illustrated or enriched by Science, we may name the following, taking together without distinction the points of conflict and the points of evident co-operation :—

(1) First, the question of materialism and spiritualism, with the subsidiary question of what is true and what is good monism.

(2) Then there is the great discussion of the mechanical theory of the Universe, opened in later days by Mr. Balfour,[2] and pressed far by Professor Ward.[3] A popular introduction to this might—but with great difficulty—be given by some highly-gifted writer.

(3) We shall need a brief account of *Evolution* and its discrepancy (if any) with Revealed Religion ;

(4) Of *Natural Selection* and its relation to Theism, to Teleology ;

(5) The relation of the same to Ethics, to Freedom, Pity, Justice, Hope.

(6) As a particular but most momentous instance under the above heads, we need a dis-

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[1] Osborn's *From the Greeks to Darwin* meets the need not entirely but in important respects.

[2] *The Foundations of Belief.* See especially the eighth edition, with new introduction (Longmans. 1901).

[3] *Naturalism and Agnosticism*, by James Ward, Sc.D. (Adam and Charles Black. 1899, and new ed. with fresh matter, 1903.)

cussion of Man's Place in Nature—of human origins, human dignity, and the future of man. For this there is much published material. The naturalist study of all this has not so far given us of its best. "We drove in a body to Science the other day for an antidote [to our "modern malady of sameness"]; which was as if tired pedestrians should mount the engine-box of headlong trains; and Science introduced us to our o'er hoary ancestry — them in the oriental posture: . . . We were the same, and animals into the bargain. That is all we got from Science. . . . We have little to learn of apes, and they may be left." So our novelist.[1] If he is scornful, light of touch, sweetly bitter, was there not a cause? We need a happier view from Science of 'Man's Place'; a more patient consideration of the view on the part of tradition.

(7) This matter of human dignity touches the great new studies in which Psychology receives enrichment, discipline, helps and apparent hindrances, from the side of Physiology. There are fightings here as well as sober work.

(8) We shall want instruction about Heredity; to know whether its laws make free action impossible, Free-will less conceivable.

(9) We shall need examination of the Social conceptions which Science brings us; conceptions of the origin and nature of Society, and

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[1] Meredith, *The Egoist*, p. 2, ed. 1889.

(10) Conceptions of its interests, and the proper conduct of its affairs.

(11) Then, to return to matters rather of speculation than of policy (and yet needing if any good is to be effected to be treated as matters of policy as well as of speculation, matters patient of practical tests), there is the Fall of Man, and what it means in view of the Rise we are told of; and

(12) The question of the place and nature, or rather of the very existence of Sin in a life which is governed by Evolutionary forces. What is sin? Is it merely an arrested development, an atavism, an inevitable and proper stage in progress? In sin have we only caught our nature in the making? or is it something that *ought* not to have been, that shall not *itself* and by itself contribute to the end? Is it, in fact, *Sin?* and is there forgiveness and redemption?

Here are subjects enough suggested; for alas! they are not suggested for present discussion.

Professor Huxley's *Evolution and Ethics*, The Romanes Lecture for 1893, is extremely important both for its special argument—which does not concern us in this little book—and also for its expression of the scientific spirit in its most impartial and most instructed mood. If I have not quoted from its pages here and there, it is because I believe every word of it to be of the highest value.

NOTE ON THE WORD 'MONISM'

THE word Monism having been lawfully employed in a particular connection by physiologists is now repeated in a very absurd manner by ignorant critics of the Faith as if it stood for some new revelation of Modern Thought! All thought-out Theism, and therefore all thought-out Christianity, is monistic in the absolute sense of that word. For 'Monism' is the view that ultimately all forms of experience are to be referred to a single cause, that there is but one fountain of reality. But there are many departments of reality, and there is a departmental monism which is innocent in itself if it does not monopolise the name which it uses.

The two worlds, as they seem to us, of consciousness and of objects (mind and matter), may be logically reduced to one principle either by considering matter to be caused by mind, or mind to be caused by matter, or the two to be forms of the same reality. The question comes up in a special form when a conscious animal organism is considered. Here you have *e.g.* the brain and the thought, the nerve endings and the feelings. Face to face with this state of things, you may be a Dualist, believing that mind and brain are two strictly original and even independent existences, joined together side by side in a pre-established harmony. Just so far as this belief is ultimate it is a dualism. Or seeking a monistic conclusion, you may hold that the brain is made by mind as the shell is made by the snail (Kingsley), or, short of that, that brain changes are the effect of mind changes; and this would be a psychic monism. Or, on the other hand, seeking a material monism, you may allege, as did Büchner, that brain secretes thought as the liver secretes bile; and this would be a physical monism. But the name monism has been specially claimed in this connexion by those who think with Mr. Carus and others that brain and thought are two sides of one reality. This is the most tolerant psycho-physical monism; but it is impossible to name the one reality within animal life which relates the two terms, and in the long run it will be impossible upon this method to preserve a belief in the special characteristics of spirit, among which a superiority to physical determination is the most important.

A wise monism, as it seems to me, seeks the unity of the various objects of knowledge much further aloft than in any of the objects in particular or all of them taken together. While recognising their real distinctness it refers them all to one ultimate reality; and this Reality is God. What is called Monism by some popular writers is really not Dualism but Pluralism, for it announces an independent unity of being for the particular class of facts known to the given popular writer.

CHAPTER V

THE MEETING OF DIFFICULTIES: POPULAR BOOKS

THE difficulties, we must recognise, are in some cases very subtle in their speculative nature, but always very practically important in their effect upon the lives of men, for whom they lessen the general confidence in Religion and check the positive adventure of the spirit which can alone arrive at certitude.

We have seen that we cannot simply ignore the hostile statements, judging frankly that there is something gravely amiss in the science which in some sense produces a challenge to the interests of prayer. Can we directly oppose them? or is it possible to arrive at a true solution by a detailed conciliation, at whatever cost, of the religious position with that of natural science? or is it wiser to rest upon the ground of idealism, to reassert the great truth of the unity and the spiritual nature of ultimate reality, and show the impossibility, the essentially irrational nature of any subjection of *genuine* spiritual convictions to any so-called evidence drawn from the world of phenomena, which finds its being, or at least its consistency, in the observing spirit?

Before addressing ourselves further to the principal alternative methods—of detailed debate or conciliation, and of philosophic criticism of materialism as such—it may be well to stop for the consideration of a certain actual and practical question of procedure and method which has quite recently come into view. In a former chapter mention was made of the partial character of the truce between religious and purely scientific thought. That truce belonged, we said, to the higher regions of education. In the less fully, or at any rate the more recently, educated classes, there was a great deal of force, we said, in the old debate. It showed its presence in the working classes where there is but little leisure for reading, little to *prejudice* men in favour of the old order, very little to encourage that temper of patience in thought of which Sir Thomas Browne knew the value.[1]

Well, we have seen in the last year how real the influence of Scientific Doubt, as it is roughly called, is among the labouring, hardly driven classes. In a popular newspaper, a wonderfully popular writer, with many gifts of sympathy and insight and courage, has reproduced the old harsh criticism of spiritual belief. A number of books have been cheaply reprinted and widely sold, in which the Bible and what appear to many to be the foundations of Religion are subjected to a kind of criticism which is new to the new multitude of their readers.

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[1] "If there arise doubts in my way, I do forget them; or at least defer them [it is this second course which we recommend], till my better settled judgment and more manly reason be able to resolve them: for I perceive, every man's reason is his best Œdipus, and will, *upon a reasonable truce*, find a way to loose those bonds, wherewith the subtilties of error have enchained our more flexible and tender judgments."—*Religio Medici.*

And the Church, it is said, has done nothing for defence; nothing for her own defence against this wider attack on the plains; nothing for the defence of her most dependent children against an overwhelming force of cleverness. What ought to have been done? what ought to be done now?

Something by putting what we have in our own hands into cheaper forms. Aubrey Moore should be reprinted; many of the older tracts put forth twenty years ago will still prove useful; new answers to these old doubts, answers which will make use of the stronger motives ruling towards good in the serious labouring men, must be provided.

Yet it will have to be remembered that it is easier, in this matter, for the attack to be cheap than the defence. If we have no sixpenny books, it is partly because we have no sixpenny argument. The criticism of old truth from some newly discovered point of view is easily made effective. The answer is not effective, not easy. The position attacked is an old one, whose strength depends upon a long gain of truth through many ages. The hole in the wall made by a well-aimed shot is seen and known of all men. But the stout foundations which make the breach insignificant, these cannot easily be displayed; perhaps they cannot be displayed at all. Perhaps belief in them can only be produced by a long consideration of many features of structure within our reach, above the ground level.

Is it not the fact that the Church has never had a short and simple answer? Do you not suppose that the Epistles as from James had at first a wider circulation, a heartier reception than St. Paul's difficult and, to common minds, inconclusive appeals? Could not something more effective, less discursive be written, a contemporary might say, than this Corinthian Epistle; something more on a level with common apprehension than that other which circulates among the churches of the Lycus? Yet, it is the Pauline Epistles which have survived, which rule the Church, and not the trenchant proofs of the Apostle's nothingness. It was Arius, not Athanasius, who captured the music-halls, but who knows where to find an Arian now?

Perhaps it is the rule, the necessity, that the Truth's answer should be cumbrous and large, hard to receive as it is hard to declare, and even a little over-slow, for our bright haste, in the production of itself. We must try, then, to show some sixpenny answers, but we must not be broken-hearted if they are few.

And then, for further succour to distressed believers, might it not be well to seek to put theology, religion, positive treatment of religious truth, rather than apologetics into their hands? The new science publications interest by their actuality. They deal with real facts, and with ranges of fact new to their readers.

I would give, to balance them, other Natural Science books without the atheism, but I would also give books on Science other than Natural. It is positive fact, after all, which engages the mind. And we cannot resist an impression of the reality of *that* the treatment of which is full of interest. It is matter for rejoicing, indeed, if, even through books of controversy, our people should gain deep impressions of the reality and importance of the laws of Nature. I would have them gain in the same way an impression of the reality of Grace—or rather, not by controversial works, however richly furnished, but by discussions, descriptions, employment of the facts of spiritual life.

Good theology will bring the conviction of the substantial character of its subject-matter, of communion with God, just as good science fixes in men's minds the conviction of the reality of nature.

It is worth considering, then, whether our cheap books should not be reprints of great religious works, in a really good form; not, if one may venture on a detail, in the discouraging outward form of tracts, but as if they too were as well worth reading as Macmillan's admirable paper-covered novels.

It will need no scientific knowledge to select these books, but a judgment of genuine theological interest. They will strike the new reader with the sense of a world of reality to balance that to which the naturalists introduce him. They will tend to foster the growth of that spiritual life which affords the sure premiss for debate against materialism. A book of the criticism of Haeckel may only send men back to Haeckel for further instruction, not in Science, but in Polemic. But a book of good poetry, with *Locksley Hall Sixty Years After*, may give them courage to rely upon the sure grounds of conviction which they carry within themselves.

So much I venture to interject concerning the present new movement of naturalist criticism among the workers; not in disparagement of more practical courses, if they can be undertaken, but for consolation if we meet a difficulty in laying hands upon suitable controversial writings. Much, I would add, may probably be done *vivâ voce* in private conversation or public meetings; more, I am inclined to think, than, just now, in other ways. For, in public meeting, a striking and entirely apposite treatment, and one exactly suited to the audience, is inspired by the audience itself and greatly assisted by such public opposition as may be forthcoming. And, moreover, there are men well equipped by information and thought to address such meetings, or to speak with individual critics, but who lack the gifts or the long leisure which are necessary to the production of treatises at once *clear*, *correct*, and *short*, treatises which will appeal to uncultivated readers without failing to satisfy the only kind of writer it is worth our while to enlist.

This last word may form a transition, from the particular subject of our digression, to the consideration of the main requisites of controversy which we put upon one side.

NOTE.—The call for good, cheap books has been well answered in at least two instances, namely, by the publication, at sixpence each, of Mr. Illingworth's *Bampton Lectures* and Archdeacon Wilson's *Essays.* May we hope for a sixpenny issue of Romanes' *Thoughts on Religion?*

CHAPTER VI

THE MEETING OF DIFFICULTIES: SOME METHODS OF DISCUSSION

We may now mention briefly some particular methods of discussion, and deal somewhat more at large with two of them.

(1) The method of anathematisation needs no long description. It consists in setting the crude statements of popular doubt in contrast with formulæ of religion not less crudely stated. The hope underlying it is that the Christian will abandon without question what is shown to be inconsistent with his position. It is dangerous for the believer in whom the principle of authority may hardly bear the strain. It is uncharitable towards the doubter, for whom the way of spiritual conviction is made unnecessarily hard. It is too often founded upon ignorance of Religion as well as of Science; and it constitutes a danger which cannot be left without remark. There are young men in whom the new knowledge is fermenting, producing by-products or at least transitional products of statement formally inconsistent with religious belief. They must be allowed time. The new knowledge will ripen,

will take its place. A man must be allowed to lay hold of his Christian faith at the point which seems nearest, or clearest to him. To challenge his provisional conclusions, say, from geology, is to force him to think that Religion can only be his by "the sacrifice of his intellectual life."

If it is difficult to detect the weakness of this method in the case of a plea for religion, it may appear more readily when it forms part of an argument hostile to religion. We have protested against the rejection of a scientific conception on theological grounds. Exactly the same rejection is advised by Ernst Haeckel on what may be called anti-theological grounds. In the *Last Link* this really great naturalist pleads for the belief in the *Inheritance of Acquired Characters*, an alleged fact to which he gives the very good and convenient name of Progressive Variation. The conception itself forms part of Darwin's system as he left it, and is by no means exploded, by no means inconsistent with exactly that conception of Natural Selection to which all recent advance in biological theory owes its first impetus. But in what strange terms Haeckel invites us to affirm the fact of this inheritance. "If one denies, with Weismann, the heredity of acquired characters, then it becomes necessary to have recourse to purely mystical qualities of germ-plasm. I am of the opinion of Spencer that in that case it would be better to accept a mysterious creation of the various species as described in the Mosaic account." The argument is of the form known as *reductio ad absurdum*, for Haeckel does not seriously propose to believe Moses. The dread of such a companionship in thought is held up *in terrorem* for Weismannists. You must believe in progressive heredity on pain of finding yourself believing the Bible, for there is no middle course. One sees the weakness of the method when employed in this interest. It has precisely the same weakness when it heads the other way, when it runs : You must *not* believe in Progressive Heredity on pain of finding yourself unorthodox in Biblical Exegesis.

It may be added that if Professor Haeckel gives us thus a fair example of the method of anathema, his name recalls to us an instance of the positive method, the method of proof by particular evidences. For in 1868, thirty years before the date of the *Last Link*, Bathybius was announced to the scientific world by Huxley under the name Bathybius Haeckelii, and in 1872 was claimed by Strauss as the fact which made Christian belief at last plainly irrational. Let us on our side be wary in accepting some new discovery in the behaviour of matter as ground for conclusions favourable to that belief which has survived so many defeats in the estimation of men.

(2) We must here dismiss briefly also the work of detailed conciliation, and the work of detailed refutation. In the first of these the object is to review points in which the Bible record coincides with the sequences ascertained or made probable by investigation. There is rejoicing over ants which actually store grain. Solomon is relieved of the charge of taking eggs for corn. We shall have something to say of this under the head of Evolution and the Bible.

This method grows out into something much more serious and probably more valuable, in two directions, namely, where metaphysics seems to hold out hands to the advanced physical investigation of matter in itself, and where a certain theology welcomes those advances of knowledge which promise to bring some things long regarded as miracles within the account of natural cause and effect.

How far these acquisitions are of apologetical value for theology or metaphysics is matter for a separate and not short or easy discussion. But both Religion and Philosophy are always interested in the explanation of facts.

(3) The work of detailed refutation of Science matches that which some scientific criticism undertakes with regard to Religion. Both are rather fruitless. "Here and here, has Science hurt me, How shall I hurt Science, say?" The inconsistencies of scientific teaching are made

much of, its discrepancies, the intervals unbridged in its systems. The inconsistencies are inevitable in a knowledge which grows from year to year, correcting former errors at every step. It might be well if the discovery that yesterday's conclusions were too rapid, unjustified, and need revision, acted as a warning when it is a question of forming new conclusions to-day.

Religion, with its great tradition, with its world-wide body of experts, moves more slowly; but she has her own hasty mistakes to answer for. The lesson from the changes and the reversals in scientific teaching is that we should not readily give ourselves to panic or to anger. To-day's most confident assertion of the final disproof of revelation is to be examined with patience. It may turn out to-morrow to be inconsistent with wider knowledge, or to contribute to the defence of tradition.

As for the intervals, the breaks in naturalistic systems, we cannot found anything securely on these. To build upon the lacunæ in scientific knowledge is to make your building strong in proportion to the weakness of Science, and to find in each fresh discovery of natural law a menace to the consistency of faith. It is like the adoption of a political economy which depends upon ruining the neighbour nations, a commerce prosperous by the poverty of possible purchasers. It is like a larger statecraft which should found a nation's peace upon anarchy and decay in other empires. It is menaced by the growth of good, and has time itself for an enemy.

I have spoken of such a method, such a temper as it is concerned with a succession of details in Science. It grows into more importance and a far greater respectability when it is concerned with the large *ideas* which govern Science or arise from it. Here it employs knowledge and reasoning which may be of genuine benefit both to Religion and Science, but it employs them, as I conceive, in an order which requires a certain correction to keep it free from danger. This larger kind of criticism may be considered under a separate head, and for convenience in the special instance of the doctrine of Natural Selection.

(4) In the doctrine of Natural Selection we have a theory, or as I should prefer to say, a strong conjecture from observation, which is highly important for biology, which has far-reaching philosophical effects and applications; which, moreover, is thought to have a most serious and destructive bearing upon the statements of Religion, and which finally is still open to very effective criticism from a scientific point of view. I propose to reserve for another place what I would put forward in discussion of the legitimate effect of the doctrine in question. It

is to serve here for the exemplification of a method in controversy. The position of the debate, if we disregard its merits, may be stated somewhat as follows. Natural Selection, urge the critics of religious belief, has weakened, has destroyed (we take the extreme view) the argument from design, and all those supports of theistic belief which rest upon the supposed *guidance* of organic life towards predetermined ends, and by a power outside of organic life itself. We must refrain from pursuing or fully expressing the thought. Briefly stated, it is that Natural Selection, itself the actual method by which modifications and species are produced, is thoroughly anti-theistic in its effect, constitutes indeed the great modern weapon of unbelief. This, we hear, is our great gain from Darwin. We have swept away that entrenchment in the evidences of the organic world in which Natural Religion thought itself secure. So runs the hostile statement.

Now, from the first, the theory or principle of Natural Selection has had to fight against strong scientific convictions, and there remain still, I had almost said unweakened, very important considerations tending to its rejection. I think it may be fairly said that if Natural Selection has a stronger hold on our belief to-day than at first, this is not by reason of the disappearance of immense difficulties, but rather by the constant addition to our knowledge of facts which no other explanation seems to fit. The extreme and thoroughgoing 'Selectionism' of Weismann, in which *every* character is of necessity spoken of as determined by elimination (because there is no room, at any rate in metazoa or metaphyta, for the direct effect of the environment, or the inheritance of characters acquired by use and disuse or otherwise) has even produced by reaction a new and very striking volume of contrary considerations and of facts which cannot be brought under the control of his system. Semper, Eimer, Cunningham are names which occur at once in this connection.[1] There is much force in the contention of Gulich, to which attention was drawn by Romanes, that to make Natural Selection effective we must suppose physiological barriers to have come into existence independently of Natural Selection. Otherwise a process must come into play, which is called by a name rightly detested by Mr. Andrew Lang—Panmixia. In botany again a great deal of evidence has been brought together (for example by Professor R. Henslow) against that continuous and 'indeterminate' variation which seems necessary to afford material for Natural Selection. There is much reason to think that large numbers of plants growing in one soil vary simultaneously and by considerable steps—in fact that variation instead of being individual and graduated is social and *per saltum.*

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[1] The work of Semper is not subsequent in time to Weismann's, nor is it anti-selectionist in conclusion; but it represents a strong reaction against the free elaboration of selection-theory. Eimer's *Organic Evolution* is an attempt, largely planned and ably worked out, to show a guidance in nature of organic specialisation quite different from the free competition of variant forms. He conceives specialisation to be governed by a Law of Growth operating in the whole organic population taken together. A work by Mr. Cunningham, the translator of Eimer, called *Sexual Dimorphism in the Animal Kingdom*, is worth close attention.

Well, how should these countervailing facts and considerations be used in *apologetical* controversy as such, as distinguished from controversy within the biological schools? The answer given in practice seems to me a mistaken one. The practice has been to *accept* from the critics of Religion the statement that Religion could not stand against Natural Selection, and then to seek to weaken the grounds of belief in Natural Selection by considerations which, in favourable instances, are drawn from the scientific armoury I have referred to.

This method seems to me faulty in two respects. First it *commits* Religion to a fight with Natural Selection in which the anti-selectionist ally may after all be worsted, Briefly, it may turn out that the selectionist doctrine is *in the main* true; and religion can have no possible interest in believing what is not true. Probably (if I may venture an opinion) the actual state of the case is that a larger place must be left to direct effects than our thoroughgoing Selectionists admit. I am myself a very humble follower of those Biologists who have always hoped that Natural Selection would prove to be active over the whole field of organic facts, and who think that many supposed exceptions will on further investigation fall into place in the argument for selection. But both teachers and taught may be doomed to disappointment. Still, *any* survival of Natural Selection at all will be, on the statement so rashly accepted in the method I criticise, dangerous *quantum valeat* to religion. If automatic self-adaptation is a fact inconsistent with the Divine Government, a single instance of it will be a peril to Religion. Religion, then, cannot afford to ally itself with Lamarckism.

But, further, the scientific anti-selection argument is itself put at a disadvantage by accepting a theological implication. Just in so far as any *motive* is admitted which does not properly belong to scientific inquiry, an argument influenced by it is weakened or hampered for scientific purposes.

How then ought the affair to be managed? In the first place we should refuse to accept without examination the alleged anti-theological force of selectionist views. It is highly in the interests of unbelief that we should accept the allegation without question. It is therefore precisely here that questioning should begin. The scientific criticism of Selectionism should run its own — and as I think unprosperous — course, without theological implications: and the theological apology should take the following form. First, we question whether Natural Selection is at all incompatible with a properly-stated argument from Nature to God. But at any rate, secondly, the doctrine of Natural Selection is very far from the position of demonstration; it is not sufficiently substantial to bear the weight of the negation of a belief forming *part* of convictions which have so many supports in experience as a whole.[1] All the scientific criticism forthcoming is here in place; and it is urged without a committal of the fortunes of religion to its success. This may seem a mild and unadventurous method of procedure. It is much more favourable to the interests of truth in both fields, grace and nature, than one in which the argument runs thus. You say that the fact of Natural Selection disproves Design. We accept your description of the issue; and we rejoin with a denial of your facts. Natural Selection does not happen.

It would be better even to take the method of anathema, to say: You allege that the doctrine of Natural Selection is incompatible with the doctrines of religion. We accept your statement fully; and we need no more for the conclusion that your doctrine of Natural Selection is false.

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[1] Natural Selection, indeed, when it strongly attracts the mind, runs some danger of becoming a kind of academical formula rather than a real explanation. Some illustration of this point will be found in Appendix A, p. 150.

Even this method, I say, would be safer, for we have much surer grounds for trusting against Darwin the statements of Religion than those of non-Darwinian biology.

CHAPTER VII

THE MEETING OF DIFFICULTIES

FURTHER REMARKS ON THE IDEALIST CRITIQUE: CHRISTIAN SCIENCE

WE have already said what is absolutely necessary of the place held by metaphysical criticism in the controversies produced by Science. But before leaving the subject of methods it seems well to consider certain particular dangers which accompany the use of the idealist argument at the present moment.

This is plainly not a suitable opportunity for a fresh attempt to state the idealist case in popular language. Dr. Rashdall's representation of it in the first essay of *Contentio Veritatis* may be referred to as the work of an entirely competent hand, and as likely to be within the knowledge of those who read this book.

Since I am about to speak of some perils, as I conceive them, in a certain *employment* of the great teaching of Idealism, it is perhaps necessary to repeat first that I am able to accept that teaching with the most entire assent, and secondly, that I am quite sure that it is in the considerations which idealistic philosophy emphasises, that the strongest defence for thought is found against the real perils of Naturalism. There could be no more valuable work than one which should succeed in confuting *materialism as such* in the minds of the great multitude, as it has already been confuted—is it too bold to say?—for most men who have leisure and opportunity for philosophical inquiry.

It is not merely the case that a materialistic *conclusion*—the conclusion that stuff is the ultimate reality and thought a mechanical product of things—is deadening to the mind, and carries with it in *posse* the destruction of all that makes life worth living; but the *methods* also of externalism are in the highest degree mischievous, even when those who follow them stop far short of a materialistic conclusion, even if they imagine themselves to have arrived at a defence of religious belief.

And consequently the fresh production from time to time of the foundation argument of Idealistic monism—leading to the conclusion that *the ultimate reality is one and is spirit, and the existences we observe are real for spirit and in spirit alone*—is valuable and more than valuable, not only in so far as it defeats the movement towards a materialistic, that is an atheistic and an inhuman, monism, but also because it prevents Religious practice and belief themselves from resting upon the evidence of particulars gathered out of the world of sense.

Enough has perhaps been said to avoid a misunderstanding which is easily created, and thus to make room for the suggestion of certain dangers which may accompany the employment of the Idealist argument for the succour of unlearned faith against the forces we have all along had in view.

We have already remembered that pure idealism, as such, will not carry a man to Christianity. Theism, we said, is not faith. Philosophy is not itself Religion; and if pure idealism were thoroughly established in the public mind, this could not satisfy us; for the Christian Religion is not simply a pure idealism; it contains many important statements of historical fact.

We have now to add a word on the Ethical bearing of Idealism. Idealism may be, and *ought* to be, pushed so as to arrive at *goodness* as the ultimate truth. But still it is possible to state an idealist argument of a very high and abstract form in such a way as to seem to transcend the distinctions of ethics, and show right and wrong, goodness and badness as one thing. Even such a statement might be made with what I would call *safeguards of thoroughness* which would lessen its dangers. But for the mind newly presented with this high argument, there is great possibility of a rough and ready monism *at too low a level*, and this is especially dangerous in respect of ethical conclusions. By monism at too low a level I mean the kind of thought in which the profound identifications of metaphysics are supposed to be verified in the near-hand matters of sense-experience—and you have an example of it in Ethics when that untutored idealist the thief effects a coarse and practical synthesis between *meum* and *tuum*.

Summing up the case not by a formal division but by regard to actual occurrences of thought, we may group all the above dangers under one first head, viz. the disparagement of the importance, the significance, the sacredness of the actualities of Religion; a slight regard for the historical content of Christian belief, some danger of forgetting, more than our native frailty in any case makes us forget, the character of Religion as a system of definite precepts, as an appeal calling us to momentous choice, momentous toil and conflict upon the field of good and evil actions.

In the second place may be mentioned that which is philosophically the foundation of all these practical errors, namely, a misunderstanding of the idealist denial of reality to the realities of the materialist. It is supposed by men newly introduced to the language of Berkeley that a spiritual monism denies to matter that reality which the 'plain man'[1] ascribes to it. The proper teaching of idealism is not this. It is rather that the 'plain man's' notion of reality is too small to fill the great word he uses. It does not deny the truth to which he points by calling things real, but it asks him to accept a humbler or a qualified name for this truth, and to reserve the name 'real' for that which is absolute and unchangeable. It is 'contingent reality,' 'phenomenal existence,' relative truth, to which we, as plain men, point. It is very important to insist that these ought to remain for thought as they were before idealism invited us to regard a higher region of absolute substance. The word 'phenomenal' has itself much to answer for. It is a most practical necessity to insist—both for those who are inclined in their first conviction of outward existence to reject idealism, and for those who are hasty to think the world a dream—that nothing in idealist teaching should make us doubt that the phenomenon is *phenomenally real.* It is not impossible to suggest this thought in common words. You may say even to village children, while impressing upon them that God alone is the fountain of all being, that the hills and the birds are 'as real as birds and hills can be.' They are not sham hills, fancy birds; but, in one word, creatures of the Creator, *actual* and most significant results of a real Power. Indeed, in the one phrase, so common to devout language, of "created emptiness" lies much of the error which both religion and true idealism have to combat. How can the result of creation be emptiness? It was emptiness which the Creator filled when He created.

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[1] I borrow the expression from Dr. Rashdall, and take it to stand for a mental position different from that of reasoned materialism, of which a few words have been said above, at p. 34.

There is room for caution, then, for the teacher of Religion who is stirred up by the arrogance of materialist unbelief to display the essential lunacy of doubting one's own personal will on account of the testimony of some physical structure which exists after all for mind alone—that very mind whose title to conceive it, the physical appearance (to speak in a figure) presumes to challenge. There is room for caution, lest the hearer should suppose that what he knew as real is no longer to be thought real *in the sense in which he thought it so;* that there is no difference between heat and cold, between sickness and health, between poverty and plenty, between mildness and spite, between life and death.

We are using for our grouping, not formal headings of division, but actualities of popular discussion; and here we have an actual popular movement of thought as striking as the movement more interior to theology, of which we spoke first. That first movement is the high theologic disparagement of the moments of the saving Life of Jesus; of the doings, rules, ways of the 'Empirical Church,' to use Harnack's phrase. This other is the touching and popular enthusiasm, which goes by the name of Christian Science, and which is made up on its better side of a longing for spiritual security, and a strangely half-learnt lesson of Idealism. Here, certain of the high commonplaces of philosophy have been heard as startling news, by minds unused to the tone of metaphysical inquiry.

It is even urged that the remarkable woman who is said to lead so many in America and England to real gains of health and present happiness, was herself the originator of the doctrine of the ultimate and sole reality of mind. It is quite true that this movement, like others of our day, is a fresh reaction provoked and produced by the materialism which lately oppressed our generation. But it will be confusing for the history of thought, and even for the history of the Anglo-Saxon race, if it continues to be believed that Mrs. Eddy anticipated Bishop Berkeley.[1] This may even lead to a reversal in thought of those centuries which, though they are unreal in a very high degree, nevertheless should remain as a self-consistent part of the furniture of the philosophic and every other mind. It is with something very different from mere hostility that we speak of the Christian Science movement. It is a kind of witness, we have said, to idealism. It is further a recognition of the power of the spirit over our own bodies; a recognition which is of real value, and is practically effective in many cases. Further, it is a vigorous attempt to reach that *experimental, verifiable* method in the spiritual life, of which public religion has been too often apparently forgetful; and it is in tune with modern scientific inquiry to this extent, that it endeavours—one may not say with substantial success—to lay hold of those acquisitions of knowledge in the theoretic analysis of matter which seem at times almost about to reach the impossible experimental proof of the sole reality of spirit.

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[1] *A Review of Christian Science* (S.P.C.K.), a short pamphlet by Miss Margaret Benson, is of great value.

We ought on our side to bring out of our store those great *experimental* elements of Christian life which are aimed at in this new and mixed teaching. We ought to rise out of our practical materialism, our distrust of prayer, our subjection to physical needs, our hunger for earthly stores, our dependence upon earthly influence and protection.

But we must seek to correct the misapprehension of idealism which leaves matter without significance, both because it is contrary to truth, and also because it leads to a neglect of the duties of mercy, a neglect of the great conflict of conduct, the great succours of Grace.

CHAPTER VIII

THE SEARCH FOR RELIGION IN SCIENCE

In the example of Natural Selection, we have spoken of the defence of Religion by means of the refutation of Science; or rather of a biological doctrine which, of course, by the success of the refutation is proved unscientific. There have been many essays towards an argument of an opposite kind, one which is to arrive at religious affirmation by means of Science itself, on lines already briefly alluded to in an earlier chapter.[1] The former of these is related, as a larger and better variant, to the method of detailed criticism of Science; the latter, not in exactly the same way, to the method of detailed conciliations. But it is not merely a conciliation, a display of agreement between two lines of truth considered as distinct: it is the effort to find the one truth in the other, to find Religion in Science and God in Nature.

We must be content to have simply mentioned this, often highly valuable, line of work. It stands of course in the line of descent from the classics of Natural Religion, best known to us in the example of Paley. There is much which is still valuable in Paley's exposition, very much which is invaluable in his spirit of courage and hope. Among modern writings, the Duke of Argyll's books, *The Unity of Nature* and *The Reign of Law* belong in part to this class; or rather, though the work of a man who distinguished the real *grounds* of Religion from all subsidiary supports, they exemplify the kind of treatment by which others seem to hope to build up Religion itself. Of recent books Drummond's *Ascent of Man* may be noted (a more valuable book for the purpose we have now in view than *Natural Law in the Spiritual World*), and *The Ascent through Christ*, by Griffith Jones. The title of Dr. Newman Smyth's book *Through Science to Faith*, is descriptive of the method of which it is a good example. Those who find encouragement for faith in the minute facts of life have in *Religio Medici* (Charles Good) the work of a very highly accomplished naturalist whose name does not appear on the title-page.

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[1] p. 34.

If there were question of distributing books of this class in a cheap form, it would be necessary to take the utmost pains to secure scientific soundness and scientific *caution* in all parts of the argument selected.

The boldness, the skill, the industry, and the high charity which have produced many of these books call for the warmest gratitude. Some of them contain scientific teaching which is, on its own account, of great interest. A small book comes to memory called *Guesses at Purpose in Nature*,[1] which contains a most luminous account of the life-history of the Gulf-weed, the wonderful oceanic vegetable which lives and multiplies without fixed attachment to make the great floating weed-banks of the Sargasso Sea; and which in the process of its reproduction displays the most delicate and interesting adaptations.

But we are now considering books of this kind as they endeavour the great task of finding the very supports of Religion in Science itself, and, in some cases, almost its form and its foundations. There are minds to which Science itself is thus fruitful, as Nature itself is fruitful to others. What share, even in these positive or poetic minds, is taken by an unconscious, antecedent, and surer knowledge in the ascent which they describe as beginning on the ground of Nature, or of Science, is matter for a different and a larger inquiry.

In this place the subject must be left with the suggestion only that too often, at least for most of us, the pursuit of Religion *in* Science is un-profitable, *not* because ingenuity is lacking or courage to overcome the difficulties of such a task, but because the triumphant result, affirmative as it is, turns out something different from what we desired.

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[1] *Guesses at Purpose in Nature*, by W. Powell James, M.A., S.P.C.K. It is immensely anti-selectionist, and its apologetical system is unsatisfying, but it is full of admirably interesting instances of adaptation.

The besetting weakness of the attempt to found Religion on Science lies in the fact that *unless faith be already secure*, that which is founded on Science turns out not to be Religion. Whatever language it uses, however acceptable its conclusions, the product lacks that quality which is required by devotion. To speak briefly, unless faith rules over the procedure, the result of the process is not faith. It lacks precisely that element of adventure, of obedience, and of hope *transcending the evidence of the senses*, in virtue of which Religion does its work, that work which vindicates its reality and *transcendent* truth, by effects produced within the world of sensible experience. Or if we are not conscious, at the close of such an apologetic, of this lack of quality in the result, is it not because, *sub silentio* and unconsciously, a larger faculty has supplied to the argument precisely that religious content which scientific investigation alone is credited with?

Theism is not faith, least of all the theism which proves the being of God as men prove the existence of an Ice age. Nor, to speak frankly, is the proof even nearly good enough for the work required of it.

The true origins of religious conviction lie in another region of experience. But an enlightened Science in the service of faith could do more than suggest illustrations to a previously formed conviction. It might demonstrate exactly the fact that anti-theistic conclusions from Nature and from Science *require* for their security to be entertained by a consciousness which has lost the true materials for belief; and that to a believer's mind the same facts produce, by an examination equally legitimate, an opposite conclusion.

CHAPTER IX

AN EXAMPLE OF DIFFICULTIES:

THEISM AND NATURAL SELECTION

In the present volume the line of limitation chosen is that between General Theism and Positive or Revealed Religion. With topics belonging to the latter we shall not deal here.

In discussing the interests of Natural Religion it is useful in the first place to notice the proper character of the opposition, if any there be, which Evolution and Natural Selection respectively offer to religious belief.

Between Evolution as such and Theism as such, it is very difficult—impossible is the word which suggests itself—to define any serious dispute. If evolution, pure and simple, must quarrel with religion, it is with *positive* religion, not natural religion; with dogma, with the religion of the Bible and the Church. And even with the Bible it is not quite easy to catch the line of disagreement unless it be over the verse "God rested." But to this opportunity of difference, promising or unpromising, attention cannot just now be paid.

Whatever be true of the Bible and of dogmatic

Religion, certainly abstract Theism, the belief in God on grounds apart from specific revelation, cannot without unreality and strain be placed in conflict with the conception of Evolution.

For such a purpose as ours Theism may be defined as the affirmation of a personal infinite thought and will as the cause of all existence. Such a definition admits of much discussion; but our object here is not to analyse the idea of God, but to refer to it as it resides in men's minds in general.

Where then does such an idea of God as the all-wise Creator find itself in opposition to the view of the world presented to us by Evolutionary Science?

There are, of course, ways of holding the great doctrine of God which make it necessary to believe that His activity belongs to a period limited by some point or other in the past. But all such methods or moods of Theism are merely and evidently limitations, and not in any sense supports of the great foundation doctrine. In strictness of terms they are even inconsistent with that doctrine. For they imply a power in man to measure *That* which by definition is infinite; to set bounds to the activity of the Power which is by definition omnipotent; and to confine the effective range and the intensive penetration of that Presence which is in terms universal.

If we set aside such narrow views, there is no need to argue now, since it has so often been argued before, that evolution, considered as *an observed or supposed sequence in the appearance of organic forms by means of an activity continuous with that which we observe in individual lives*, is nothing but the disclosure of the way by which to our observation and thought the Mind which is in the world, and in which the world is, works out its effect. The evolution of a race, no more than the growth and development of the individual, is in the smallest degree inconsistent with belief in the overruling wisdom and power of God.

With respect to Natural Selection, the case, at first sight, is somewhat different.

For Natural Selection, when it was first preached, seemed to provide a full account of the *guidance* of evolution in organic life; and it seemed to suggest a method by which those larger cosmic changes might be directed which were brought, in aspiration and hope, within the scope of the evolutionary idea. It seemed to fill a place which *even in a Naturalistic view* had previously been filled by the name of God. Such a statement may seem very unreasonable at the present time. But we, at this date, inherit the advantage of the long pondering of the selectionist view by many minds of different orders; and the view itself has not for us the enticement and glamour of novelty; nor has it, in the process of discovery and discussion, reached all that self-consistency and strength which was at first hoped for it.

But in earlier days the new, and certainly wonderfully illuminating, theory bit into men's minds with the welcome sharpness of some rare and novel savour,[1] a savour welcome indeed to the critical and inquiring mind, but terrible to the heart and faith which could not at first assimilate or manage this new revelation, as with justice it seemed, of the mechanical in a part of nature formerly intolerant of mechanical explanations. Some of the most prudent minds were, and are still, driven by this conception from a belief in the God of Nature,[2] which in thoughtful minds demanded the support of thought in other fields, but had not been thoroughly thought out on its own ground.

The fact is that the doctrine of God had been allowed to lean upon a narrow argument from design. A method of statement and thought, which is usually called deistic, but is more properly that which the orthodox used in their conflict with Deism, made God a workman upon, or at most in, His own world. Briefly, the view more or less fully shared by the old teleologists and anti-teleologists is a view of God as if He were working, or had ceased to work, in the construction of a world which was wholly apart from Himself; or if within the world, then conditioned by rather than sustaining its constitution, 'contriving' appliances in materials outside Himself for ends beyond Himself. It need not here be repeated that the evidence of such workmanship cannot prove God in the true sense of an *infinite* and *all* wise Cause, but only a cause possessed of immense wisdom and immense though limited power, a Demiurgus of the greatest force and the most minute care, but not a Creator in the sense of theology.

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[1] Writing of a year so late as 1877 Mr. Morley describes a visit "to the hill-top, whence in his quiet Kentish village Darwin was shaking the world."—*Life of Gladstone*, vol. ii. 562.

[2] The intellectual believer is too often one in whom intelligence is active as the critic of faith but not active in thinking out the content of faith. Though the believer is intellectual his faith has not enlisted the services of his intelligence.

But at this point it is chiefly the procedure and not the scope of the proof which is to be noticed. It proceeded by way of the rejection of alternative causes, causes other than God, for the observed adaptations of the world, and especially of living beings. The adaptations were apparent. The design was held to be self-evident, or evident on a close enough inspection. There was no argument for design. But from the displayed design the Designer was to be inferred. It was the function of Nature-study to show adaptation where it was unsuspected, to accumulate instances of it which separately might be overlooked, to enlarge continually the question of their origin to which the answer must be 'the Power and Wisdom and Goodness of the Creator.'

It was on the *method of formation* that the stress was laid. If some other account could be given of the means of adaptation, the need for the supposition of God's working disappeared or was weakened.

It followed that the *lack of explanation* of natural adaptations had a place both in Science and in Religion. It was indeed by the gaps in mechanical explanation—that is, in Science—that Religion (in the argument of Natural Religion) was to be maintained. And in consequence the idea of God's working appeared equally in both systems. It was in Religion the *demonstrandum* proved by the necessity of its supposition. It was in Science the axiom necessary for the continuity of the scheme. The gap in causation must be bridged to make Science complete, and it was bridged by belief in the God of Nature. The gap in causation must be alleged by Religion, for it witnessed to the necessity of the God of Faith.

If any one thinks this an extravagant statement, let him read Paley, let him read Christian Wolff; finally let him read Huxley, in the Life, before his conversion to Natural Selection.

God was for him also required for the completion of a working hypothesis; the conception of the Creator was one which could not be escaped unless an alternative cause could be suggested.

It was in this character of an alternative for the interposition of God in His own creation that Natural Selection was in actual fact welcomed by Huxley.[1]

To us, indeed, it is the least natural thing in the world to consider that God's power is made evident in the proportion in which natural sequence is obscure. But it was not so to Wolff; it is not always evident that it was so even to Newton; it was not so to Paley, whose mind and knowledge were alike of a high order, and whose theology was sound and temperate. A fair instance of his method is found in *Natural Theology*, in the chapter on Comparative Anatomy.[2] He points out the advantage of the *valvulae conniventes* to man, and adds: "But it is impossible to assign any cause, except the final cause, for this distinction [between quadrupeds and man in respect of these features] actually taking place. In truth [the structure] must have been formed, not by action, but in direct opposition to action and to pressure. That theory [viz. of the *valvulae* having been formed 'by action'], therefore, is pointedly contradicted by the example before us. The structure is found where its generation, according to the method by which the theorist would have it generated, is the most difficult; but (*observe*) it is found where its effect is most useful."

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[1] "The *Origin* did the immense service of freeing us for ever from the dilemma—Refuse to accept the creation hypothesis, and what have you to propose that can be accepted by any cautious reasoner? In 1857 I had no answer ready, and I do not think that any one else had." See Huxley's chapter in *Life and Letters of Charles Darwin*, vol. ii. pp. 187 ff., pp. 195 ff.; also *Life and Letters of T. H. Huxley*, new edition, vol. i. pp. 241 ff. To prevent mistake it must be added that before 1857 Huxley had given up the creation hypothesis as he understood it.

[2] *Natural Theology*, vol. i. cap. xii. iv., p. 275 (Lord Brougham's ed., 1836).

Such an instance better than anything we can write shows what was the kind of view in which the absence of a perception of natural sequence could play so important a part. The argument from human ignorance is always important, and the facts to support are always abundant. But Paley's was an argument from a special kind or degree of ignorance, from the absence of a very moderate and relative sort of knowledge.

Now, when we place ourselves in sympathy with such a religious view, we can to some extent feel or measure the shock which was produced by the suggestion and the growing proof of Natural Selection as the method for the guidance of evolution.

What, asked Natural Religion, do you make of this adaptation, of this other, of the third, of the endless series, of this bewildering variety of adaptations? Surely here, and *here*, you see the Hand of God. You may speak of a sequence, a growth, a force making for order in the world at large. But what of this almost infinite series of minute co-ordinations? Who fused each to each? Surely here, where no mechanical sequence can in any way be traced, here will be the strength of our conviction of the Creator's Will.

It must in justice be remembered that the controversy of Paley and his predecessors was not a controversy, or not principally a controversy, with men who formally denied the existence of God, or even, like our Agnostics, the certainty of the existence of God. It was a controversy with men who denied His activity, or the evident character of His activity, in the world. Deists, not avowed Atheists—though the Deists were accused of veiling atheism under their argument—were the opponents they had to confute. And that which might be a very poor proof of the *Being* of God was a more than admissible proof of His *Activity* upon the scene of our external experience.

The argument from design which has here been suggested was therefore more valuable for its actual purpose than at first appears to modern readers. But this does not greatly modify its weakness when placed face to face with the new Selectionist teaching. It made the argument from design, in any particular instance, strong or weak in the proportion in which the mechanical explanation of an adapted organ was less or more nearly complete.

Moreover, it rendered the argument as a whole unstable just in so far as a method could be discerned by which the observed result might be supposed to have been reached. History itself was made to serve as an enemy of faith.

And it prepared the ground for an occasion when Natural Selection appeared as a substitute for the Divine Power, and Selectionism as an alternative for religious belief, in accounting for the present condition of the world.

The idea of a God whose existence is necessary to fill a space which would otherwise be empty, *within* a scheme of natural philosophy is wholly strange to us; nor would it at any time have borne statement in the form which is here, I think justly, employed. But it may be that we owe a large measure of this wholesome strangeness to the very agnosticism which we deplore; that Science has had a good share in sending our generation back to the lessons of a more apostolic and a more rational theology.

. . . . . .

It has been in accordance with the plan of this book that we have spent our space in consideration of the general nature of the debate we have to share in rather than in proposing the heads of a particular apologetic. But in general terms we may state what the cure must be for the position sketched.

In the description of the mischief the cure is already suggested; already one is tempted to think it begins to be applied. We see, at any rate, that it is a *theological* readjustment which is required and not one in Natural Science. Moreover, it is a theological readjustment in the highest sense conservative and positive.

No retrenchment is needed upon our belief in God's power and love, but rather the casting down of certain artificial barriers of limitation.

God must be recognised as working in all processes of the widest range and the most minutely intimate penetration; as powerful on either side of every pressure, reaching from one end to the other mightily. And if it is urged that though the *proof* of design is not stronger in unexplained adaptations, yet the *wonder* is stronger; it must be replied that wonder is to be found much more abundantly in the whole reality than in any abstract of the reality which is made by the mind.

And in the matter of organic life, the wonder will be not merely that this organ fits that use, as if God had solved a problem set to Him by circumstances beyond His control, but that the whole nature of things is such that the interaction of forces inherent in the whole produces the infinite variety of living beauty which we see, and of which we ourselves, according to one mode of our being, form a part; produces further a faculty in man to know and measure and admire, to use and influence and even understand this complex order within which, according to one true reckoning, he stands. Finally, if anywhere we catch nature in the making, if we surprise the sequence by which even man himself gained his difference from other things, we shall not by this find reverence lowered. For the whole world, past and present, comes from God and stands in Him.

> "All changes at His instantaneous will,
> Not by the operation of a law
> Whose maker is elsewhere at other work."[1]

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[1] Browning, *Luria*, Act v. *Works*, vol vi. p. 284 (ed. 1889).

NOTE ON THE WORD 'DEIST'

THE meaning or, if not the meaning, the force of this word varies in different connexions. In England it was the appellation under which was hidden a scepticism which dared not be known as Atheistic. In France it was set in contrast with fashionable Atheism as a relic of superstitious credulity. *"Il est bigot,"* said a lady philosopher of Voltaire, *"c'est un Déiste."* The word meant what is now meant by a Theist in a circle of agnostics. More accurately, it means one who believes in "a God" on grounds of reason but denies the fact and rejects the alleged teaching of Revelation.

Or again—and this is its sense for modern retrospection upon the eighteenth century—Deism is the notion of a Divine Power which was the cause of the world we know, but is now withdrawn from actual operation upon it; a Creator who is not a God for prayer.

But, further, the Deistical name is applied to the opinions of those who were not in any sense Deists, but who precisely combated the Deistic veiled scepticism, by what has been too harshly called an "Old Bailey Apologetic." This name is given to an array of evidences of God's actions within the world, almost as foreign to the truer thought of Divine immanence (an immanence not inconsistent with transcendence) as is the mechanical doctrine of negation which it opposes. The transference of name is so far just that the orthodox natural historians no doubt accepted, for purposes of controversy or conciliation, as much as they could of their adversaries' position.

The Deistic sceptic mechanically proved the mechanical absence of God. His opponent, not untouched by the materialism he resisted, demonstrated somewhat mechanically what may be called the mechanical traces of His active Presence.

The statement in the text (p. 83) that 'there was no argument for design' hardly holds good of Paley. If not argument, at least ingenious demonstration of design is characteristic of him. But it is well to note that *the* Argument is an argument *from* Design, and not for Design.

CHAPTER X

"THE RING AND THE BOOK"

A Feature in the Progress of the Doctrine of Development

The progress of the doctrine of development towards general acceptance has been assisted by a process which has received its best description in a famous poem.

Many who are not students of Browning know "The Ring and the Book"; and if any one has begun that wonderful piece and not finished it, he remembers at any rate the opening lines which explain the title. The "ring of Rome-work made to match Etrurian circlets," has been wrought out of pure soft gold by a special process.

> "There's one trick,
> And but one, fits such slivers of pure gold
> As this was,—such mere oozings from the mine,—
> To bear the file's tooth and the hammer's tap."

The artificer adds something to the gold to increase its bulk,

> "Effects a manageable mass, then works :"

The alloy is not to remain for permanent stiffening. It simply makes elaboration possible.

> "But his work ended, once the thing a ring,
> Oh, there's repristination. Just a spirt,
> O' the proper fiery acid o'er its face,
> And forth the alloy unfastened flies in fume;
> While self-sufficient now, the shape remains,
> Prime nature with an added artistry."

You have the original gold in its original purity, but now it has the work in it which was made possible only by the temporary addition of the something else which was not gold. The visit of the alloy has left behind it as result the elaboration, the design. That is how your ancient circlet or the modern copy

> "made to match
> By Castellani's imitative craft,"

is soft "yet crisp as jewel-cutting."

Something rather like this has happened to the crude fact, real but rare, out of which the doctrine of development has been wrought to its present definite form; something which may be, but only quite roughly, compared to Browning's or Castellani's "one approved device." Something has been added, which may not always remain, which shows some signs of going, but which even if it goes will leave the theory of evolution behind it, leave the old facts with a new meaning in them to our eyes—

> "Prime nature with an added artistry."

It will be worth while to dwell a little on this process in the advance of the doctrine of development towards universal acceptance; and this not only for its own sake, but also because the process, figured by the ring-making, may in turn serve as a figure for an event in the wider sphere of philosophical and religious speculation, or at least in the popular counterpart of these.

But first of the doctrine of development. The notion of evolution and of the descent of living forms with modification from some few types, had long been waiting—as long as the history of thought extends—for recognition and for proof. It remained a guess. A few facts which supported it were known, but they remained few; and the conjecture was never more than a conjecture; the ring was only dreamed of, not made; the sliver of pure gold could not "bear the file's tooth and the hammer's tap."

In the ages of free speculation, when to think a thing was almost to believe it, and when to announce it as true was to gather a school; in the old days before experiment, men had believed in organic development as in many other likely and some unlikely tales. Again, to leap over ages, in the seventeenth century, here at home, the newly awakened science-child had been ready to believe in strange origins—spontaneous, or by the sun's power—and nothing seemed impossible to the mysterious 'force of nature.' But still development was but a dream; and right down to the verge of our own time, it remained the unproved guess of a few naturalists. Of these Lamarck is, of course, the most famous; and his name remains the greatest among modern pre-Darwinian evolutionists. Chambers's *Vestiges of Creation* may stand to mark the weakness of evolutionary speculation just before the great change.

Within a few months of his enthusiastic acceptance of the theory of evolution, Huxley could see no scientific ground for believing in it, no way could be suggested by which it might have taken place, no machinery for its direction seemed conceivable. Then appeared the theory of Natural Selection, the notion of a struggle for existence among forms indefinitely varying by small degrees. This was the something not quite gold which was wanted to effect a manageable mass. At once the theory of development leapt from the position of an obscure guess to that of a fully equipped theory, and almost a certainty. Of the early sixties Marion Crawford says: "Darwin's doctrine had been promulgated, but had not yet passed into law;" and the gentle mockery gives a fair suggestion of the rapid acceptance of what had so lately been one of the least supported of conjectures. The secret of getting forward with the work had been found; the method was laid hold of—a method which might be propounded as the past and present method of nature; a method still more important as that by which in men's minds the various facts, slender and inadequate in isolation, could be wrought up into a manageable mass. At once the facts which had been the occasion of a guess became the groundwork of something very like a dogma. And the process has gone on with little or no interruption. Practical certainty has been given to the hitherto most uncertain doctrine of descent, by the addition of the at least equally uncertain theory of the method—the theory of Natural Selection, whether as in Darwin's hands combined with something of the view of Lamarck, or as in Weismann's mind standing alone as the sole 'guiding factor' of evolution, the key to all facts of adaptation and therefore (as Weismann would say) all facts of specific difference also.[1]

In this change, which we are far from lamenting, the remarkable thing is that Natural Selection remains greatly less certain than the bare general fact of development. Of the existence of development, of descent with modification, it is difficult to doubt. Of Natural Selection, intensely attractive as that thought is to us, it is impossible to deny that the most reasonable doubts exist.

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[1] Others, notably Romanes, argued that while Natural Selection explains the origin of adaptations, it does not explain all specific characters.

Its fortunes as a theory are still wavering and uncertain. If sometimes it gains great access of probability, at other times and in other quarters it appears less than ever capable of being brought into close contact with facts—such facts, for example, on a very large scale, as the hidden coloration of birds' plumage; or, in the minute field, the number and form of the Chromosomes, which are by number and form distinctive of species. It cannot be said that the future of Natural Selection as a theory which aims at covering the whole field of organic evolution is anything like certain.

And yet it is this *less* certain suggestion of mode which has lent practical probability to the *more* certain theory of evolution in general. It has given it solidity, consistency, form. It has made a science of the study of adaptations, and has thrown new light upon purpose in nature. All this seems to reflect certainty upon it. But we must not forget that other theories have passed away, which once drew real facts out of their hiding-places, and left them in the possession of mankind for good.

And so, it may be, if Natural Selection remains unproved it will be in this case. If criticism from America, from Lamarckists, from writers still to come, were at last to prove "the proper fiery acid" to volatilise this alloy; if one day Natural Selection as a theory "unfastened flies in fume," the ring will remain: you will have the prime nature with an added artistry, the old gold

> "No carat lost, and you have gained a ring."

It will be quite impossible after years of familiarity to part with the vision of development which has yet been made possible by the Natural Selection theory which I am imagining to be parted with. Even if it went, it has, while it remained with us, brought innumerable proofs to the main fact of development, proofs which must remain as supports of the independent probability of development, whatever becomes of the theory of method. Development has become practically certain within limits, and can dispense with Natural Selection as an explanation of its method; and yet, until Natural Selection was preached by Darwin, development as a doctrine was paralysed. It made practically no advance at all towards scientific acceptance.

And then further, not only has development thus permanently profited by the help of what is less certain than development, but descriptive morphology—to leave out of account all the other departments of thought and work which have been affected—has been immensely stimulated and enriched by the same, possibly only temporary, addition. Natural Selection, in fact, has acted like an organic ferment which, on its elimination, leaves the organism definitely richer by the food changed and assimilated. The amount of real and lasting gain which has accrued to Science through the wide acceptance of Darwin's explanation cannot be calculated. He was himself a collector of facts not easily matched except among the half-dozen giants of observation. But since his work began how amazing has been the harvest. In every direction men, wholly untouched by any of the supposed quasi-theological implications of his thought, have been moved by it to the study of life in all its forms. *Für Darwin* is the title of Fritz Müller's most popular book;[1] many other naturalists have spent their time finding facts for Darwin; and for every one fact they have found in support of the special theory of Natural Selection, they have found ten facts supporting the doctrine of descent, and an indefinite number of facts which add to the general wealth of descriptive anatomy and natural history.

We have here to desert our image of the ring. That serves to show how slender a basis of facts has been made capable of organisation into a formed and self-consistent theory. It does not suggest the equally important result—

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[1] Dr. Johann Friedrich Theodor Müller is famous as a direct observer of facts in many lands, and as an early champion of Natural Selection. The English translation of *Für Darwin*, by Dallas, is called *Facts and Arguments for Darwin* (London, 1869).

namely, the wonderful increase of facts drawn together into men's notice by the magnetism of a co-ordinating doctrine. It may be suggested that in searching for the facts which are *für* Darwin, men have overlooked other facts which either told against his doctrine or, as is more likely, seemed to throw no light upon it, and to be incapable of being built up by means of it into the structure of theory. This is very likely, almost certainly, true; but even with regard to the neglected facts, there is no certainty that they would have been better explored had natural history remained unilluminated by any too bold hypothesis; and by way of reaction and criticism, and by means of the jealous self-criticism which is characteristic of every really scientific worker, these very facts which seem hostile or neutral are daily drawn into prominence.

In more ways, then, than we can now describe, a wonderful kind of alchemy has been at work: Natural Selection has given probability to development, while remaining itself unproved. Development, more nearly certain than any process suggested as having guided it, yet remains only probable. Yet in the weakness of probability, and fated possibly to be changed in form many times, it remains and must remain a part of the furniture of the mind; and it has acted most beneficially in gathering a great addition to those 'mere facts' which after all must always remain far more certain and far more important than any theory about the material procedure of material changes.

It is true that the growth of substantial knowledge, while it justifies the *direction* of the theory, ought to prevent our supposing its present *form* to be correct. Where we have learned so much in a short time, much must remain to be learned. The immense accession of knowledge in other departments, in the analysis of matter and motion, strikes the same note of warning. No account of organic life could be complete which was made when so much was soon to be learned about the world it belongs to.

Still, there can be little doubt of the benefits which Natural Science has gained by the prevalence of the doctrines of Evolution and of Natural Selection. If I may mention my opinion as a student of biology, it is that both the general doctrine and the special theory of method will gain in certainty as the years go on, while at the same time the limits of the operation of Evolution and of Natural Selection as its procedure among organisms will be more clearly defined. But, I submit, even if it be shown that the fact of Evolution is less general than we suppose at present; and even if the effect of Natural Selection be shown to have a very restricted range, yet the gains which we have noticed would to a large extent remain.

In the event of a revolution in thought much more complete than any which we need anticipate, an immense addition to the solid proofs of evolution will persist; and these will demand and require some other explanation. Yet many of them are facts which might never have been collected but for the theory, and could not without it have been co-ordinated in the scale which they now follow. The gains of Geology may perhaps most justly be set down to the stimulation afforded by the *general* doctrine of Evolution of which, in turn, they form a most solid support. But it is easy to point to other classes of facts which have sprung out of darkness at the call of the special doctrine of Natural Selection. Take, for example, the facts of protective coloration and form in insects and other animals, the facts of mimicry in general; the facts of symbiosis, of parasitism with its accompaniment of degradation of organs. It is evolution which has suggested the links of relationship between active and parasitic forms; it is Natural Selection which has alone pointed out an explanation in the scientific sense, an explanation which Science could accept as non-mystical,[1] of the extraordinary adaptations of mimicry.

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[1] In biological controversy the word 'mystical' has a somewhat peculiar but a legitimate and definite meaning. By 'mysticism' in that connection is meant a pretended explanation, which in the place of an exposition of observed or conceivable natural sequences ('cause and effect') pro-

The facts of the geographical distribution of animals and plants form another large class which could never have reached their present state of co-ordination except in the light of the general truth of evolution and under the guidance especially of the notion of Natural Selection.

On the whole, therefore, the gains in fact which have arisen from these which are still in some sense unproved hypotheses are quite undoubted.

But side by side with this history of change and gain in Science itself there has gone on a parallel history in general speculation; and here the gains are not so slightly mixed with loss. Here also there has been an addition from the outside. Here much more than in Science that

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poses to substitute statements concerning causes which lie outside the range of Natural Science. Thus, if any one says, "God made the harmless snake to resemble the venomous for its protection," he is making a statement with which Science has no quarrel, and of which Science has nothing to say. But if this theological statement is proposed as a biological explanation, and as a biological alternative for the statement, *e.g.* that the similarity of colouring has survival value for the harmless snake, then the once theological statement becomes biologically objectionable, and is called mystical because it introduces terms with which biology as such cannot deal. It is as if one confronted with the statement that his house was burnt by fire, should answer, Not so, this effect was due to malice.

It is to be remembered, however, that neither side is quite free from blame in this respect. If theologians have sometimes proposed the ultimate truths of being as scientific explanations, biologists have sometimes sought to deny these ultimate truths as if they were not merely outside Science but inconsistent with its statements.

addition has been withdrawn. But here as in Science the effect of the addition remains, and it is an effect which is far from being wholesome.

The gold, let us say provisionally, was the new conception of nature won by the acceptance of Evolution as a fact, and Natural Selection as a widely prevalent method. Many gains accrued from this to our general thought. The extension of the conception of law increased, or ought to have increased, our recognition of the penetration of the whole field of sense by mind, by purpose.

But to the gold of evolutionary doctrine, something was added, not in order to make it controversially workable, but still with that effect. This alloy was the notion of the anti-religious or even atheistic consequences of the doctrine of evolution.

As I have tried to show in outline above, the fact of the 'natural' specialisation of successive forms was supposed to rob us of proofs of the creative mind. The Bible seemed to be challenged by geology; the spiritual nature and destiny of man seemed to be lessened by the suggestion of his production physically from lower forms of life.

What has happened since? By a work of examination, of apologetic, of true philosophy which has never yet been measured, and which it does not belong to me here to measure, a wiser view has been made, I had almost said, to prevail. A more apostolic divinity, a truer theism, has seen in Development the method of God so far as our natural inquiry can at present perceive it in organic life. In all the other directions which are so familiar, the same work has progressed by which the poison of denial has been shown to be an element foreign to the new statements of Science. The anti-theistic alloy has, or ought to have, flown off in fume. But its effects remain. The belief in God, shown to have no quarrel with the conception of law, has nevertheless been shaken in men's minds by the misunderstanding which ought to have passed away.

Everywhere, that is wherever men think with care, the true function of the Bible is seen to be unchecked by the new knowledge which once seemed to oppose it. Everywhere, or at least wherever men think with patience, the conception of Creation is seen to be unchallenged by our guesses after the processes of change. And if not everywhere, yet at least where the religious life is active along with physical research, it would be urged that the insoluble difficulties for a reconciliation between Science and Religion—the origin of man, the Fall, the beginning of death, the future life—have not added anything to the immemorial difficulties of faith, were as much difficulties in every preceding stage of Science, and can in no sense be solved by means of an abandonment of religious conviction.

But though the acrimonious controversy is thus out of date, the damage to Religion remains. There is a something left after the withdrawal of what was added; only here it is a negative quantity, a destruction, a hindrance. Not here "prime gold with an added artistry," but precisely otherwise. You have your facts, but you have made them mischievous: you have stopped your quarrel and left off poorer. The old certainty is not recovered which men gave up in deference to the supposed requirements of Evolution or Natural Selection. The Bible once supposed to be contrary to fact, now shown to be consistent with it, remains suspected; does not by its newly shown reasonableness regain possession of men's minds. The experiment is over, and you have spoiled a ring.

Nor is the loss one merely in the field of speculation; an uncertainty of faith, a false bias of philosophy, a prejudice shown baseless, but naturally requiring some time to pass away, some years for the reaction of patience to take place.

Unhappily this is far from describing the full extent of the loss. The damage is registered in the lives of men. It has its reality in the conduct, the exercise, the nourishment, the resultant health, even perhaps the permanently marked constitution of their spiritual being. While the false issues were in course of being detected, men were committing the guidance of their lives to one or other alternative. And now that the nature of the argument between spirit and mechanism, between freedom and necessity, is shown to be a vital argument which men may work out to either conclusion by the management of their own lives, thousands find themselves possessed within themselves only of premisses which lead to a materialistic conclusion. To speak for a moment in the terms of Religion, it is the facts of the life of Grace which can alone justify, by experimental verification, the anticipations, the confidence of Faith; and it is Faith which unlocks the treasury of Grace. Under the influence of newly-fortified doubts, men have turned away from the supplies of Grace. In losing therefore the proofs of faith which life affords, they have lost also the key to the supplies of virtue. When the doubts are shown to have no support from Science, or in the measure that this is shown, they cease to be intellectually respectable. But the neglect of Grace which they caused remains in its effects, and makes us poor in that experience of the Divine life, which can alone afford certitude in the adventure of faith.

To recognise what has happened, to recognise that there is no scientific warrant for the general doubt which men dignify with the scientific name, seems to be a part of the process by which the loss may be made good.

The question of the conflict between the Bible and evolutionary doctrine falls outside the plan of this little book. Yet, since it has been mentioned as complementary to the question of Theism and Natural Selection, I may here be permitted to refer to a volume of addresses[1] which contains some discussion of the subject. The kind of treatment which I believe it to require will, for this volume, be sufficiently clear from what has been said upon methods of discussion in general. Here I will only add that near the root of a true conciliation lies the determination of what *is* the Biblical conception of Nature. Too often critics have lost themselves in detailed objections to the actuality of Biblical details of statement, because they have judged the Bible by comparison with the latest results of research, and not by comparison with other generalised views of the relation between the world and its cause. It is the word and the idea of *Creation* which form the virtue of the Biblical cosmogony. This idea is not only proclaimed, but developed and guarded in the Bible. The increasingly intelligible world is a product of intelligence, the result of "the act of one outside the material frame."[1] The personal Will which gave origin to what we see, maintains it, orders and utilises it for His own purposes. He makes of it an utterance of His mind. The two extremes into which thought may fall are alike excluded by the Biblical account, namely, the immersion of God in nature, and the isolation of nature from God. Matter is the emblem and product of the mind of God.

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[1] *The Scientific Temper in Religion, and other Addresses* (Longmans).

We are so accustomed to these ideas that we forget how directly they are owed to the Biblical cosmogony, how original is the disclosure made by revealed religion. "Even in the idealistic philosophy of the Greeks," says Pfleiderer, "matter remains, however sublimated, an irrational something with which the Divine power can never come to terms. It was only in the consciousness which the prophets of Israel had of God that the thought of the Divine Omnipotence fully prevailed."

Grasp this main idea of the Bible. Understand the immense debt which Monism owes to it, and therefore in Monism any possibility of a relation between science and metaphysics, and you have a measure of the true and large importance of that religious view of the world which we have received. It is the one tolerant and open-eyed idealism. It is therefore at the same time the one open door for an uncrippled science, a science not hampered at every step by collision with the moral intuitions of mankind. If Lucretius shows the inevitable Atheism of a mechanical view of the world as (strictly speaking) uncaused, Plato (in some moods) shows the essential obscurantism of a theism which regards the phenomenal as insignificant. It is really by the Bible, and by the Christian common view which develops the Hebrew tradition, that we are delivered from both difficulties, and possess a mental freedom which we are too slow to trace to its source.

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[1] I take the phrase, as also a quotation of Pfleiderer, from Mr. Buchan's book, *The First Things*. This book seems to me truly valuable for its discussion of the Bible cosmogony, and because it shows that the idea of Evolution is in no way discordant with that of Christian Theism, any more than with Theism in the abstract. Mr. Buchan has also called attention to the variations in detailed cosmogony within the Bible. The book is: *The First Things:* Studies in the Embryology of Religion and Natural Theology. By the Rev. John Buchan, John Knox Church, Glasgow (Blackwood).

In view of this great gain, the real or apparent discrepancies between the prophetic and the experimental description of the world's procedure become unimportant.

It should further be noticed that the Bible itself is not committed to one order of the successive arrivals of forms and of life. Job and the Psalms and Proverbs present manifold variations from the order of Genesis. This fact of sacred literature, that is, of prophetic inspiration, is surely one to liberate the minds of judicious believers, however much it may appear to furnish food for that class of criticism which Dr. Sanday has relegated to Victoria Park.

CHAPTER XI

HEREDITY

Still following our plan, spending, that is, what space we have on a general study of the nature of questions rather than in the formulation of answers, we may here include one of the topics belonging to the *practical* side of scientific teaching. For Science bears upon conduct and not only upon belief. The most prominent of the topics having practical application is heredity; and some suggestions upon this subject are here set down.

Natural Selection is a theory requiring the existence of variations. For some time biology was content with the study of the possible method of selection, leaving the origin of variations unexamined. But in recent years Weismann has concentrated attention upon the problems of heredity; that is, first, of hereditary likeness, and secondly, of variation under heredity. The work of Mendel, brought into notice by Bateson, is virtually the most notable recent addition to this study; and if those who have followed it most closely are right, it will prove to be the most important positive addition to biology since Darwin.

All this modern study is directed towards discovering the actual operative causes, or at least the vital mechanism, of individual variations. It is more especially directed towards those causes which lie wholly within the organism itself and are not contributed by the environment. This attention has reached very considerable success, not only in the speculative work of Weismann and those who differ from him, but also in the histological investigations of the cell and of the ovum which have gone along with those other studies. Probably the best available account of these minute discoveries of the microscope will be found in Wilson's *The Cell in Development*. Certainly this book is of great importance to those who imagine that biology is a system of speculation, or that it deals only with the effort to provide a working hypothesis to co-ordinate the relatively large and obvious facts of animal life. Here they may see it engaged in the closest and most accurate work, and, we may add, reaching discoveries which put more than ever out of court an invariably mechanical doctrine of life.

It may be worth while to illustrate this point in some brief manner. From Schwann and Remak to nearly our own day, the cell theory has seemed to provide a conception of a biological and morphological unit. We seemed to have found the atom, or at least the molecule of animal forms, not its chemical molecule, but its morphological unit. We seemed to see, as it were, the brick out of which the various productions of living architecture are formed by composition. The substantial identity of all flesh seemed to be sufficiently demonstrated from the fact that in all animals and plants alike, it was constructed of cells which were, roughly speaking, equivalent one to another. But now, in such investigations as those which Wilson brings before us, we see that the cell is itself a great world of complexity, and that one cell differs from another cell in many very definite specific points; not only that is to say in size or in nutrition, but in points of variation quite as remarkable as any which distinguish one species from another. This is not the place in which to follow the matter into detail. It may be enough to say that in those wonderful movements of the nucleus which are generalised under the word 'karyokinesis,' the chromatin of the nucleus—that is to say, the portion which under certain treatment takes the stain—after falling into the very definite arrangements of which the di-aster is the most characteristic, divides up, first longitudinally and then transversely into a number of minute bodies, called chromosomes, and that the number of these chromosomes, in all the cells of a given species, is a constant number. For example, in the cells of man the number of these bodies is sixteen, a number which appears again in the onion and in the cells of the ox and the guinea-pig.[1]

The cell which seemed to be an equivalent form in all organisms, turns out itself to contain immense varieties of structure, a wonderful and definite order of vital change and a characteristic number of bodies almost inconceivably minute. I do not stop here to ask how we can contrive to believe that the number of chromosomes—the number of the ultimate fractions of an element once undistinguished in the nucleus, itself formerly undistinguished as a part of the cell—can have been determined by Natural Selection; can have been represented in individual variation, seeing that it is constant throughout the species; or can ever, in however mediate a manner, have acquired survival value. Here certainly we seem to surprise nature at work within the organism according to a law which belongs to the organism as such; and whatever be our final conclusion, we are, I think, as biologists, undoubtedly moved by such a spectacle, not in the direction of Natural Selection nor of conceptions of the direct effect of the environment, but rather to the acknowledgment that our ultimate analysis of any particular bodily form has not taken us any nearer the point in which we can explain its peculiarity or do anything other than ascribe it to the nature of the species itself. But be this as it may, and I am not at all interested for the purpose of my larger argument to weaken the force of the doctrine of Natural Selection, we have at least this fact before us that our analysis, the farther it is pressed, finds us more and more evidently remote from its goal. When first the cell was distinguished, it seemed as if the ultimate grain of flesh, that which makes the smoothness or the roughness of its texture, had been surprised,—it seemed, I repeat once more, as if we had found that ultimate unit, equivalent in its nature wherever found, by the arrangements of which various forms of tissue were ultimately explained. Presently the parts of the cell came in view—its external membrane as we once thought, its general contents, its nucleus, its nucleolus. Later, we found that the nucleus itself was far from a simple matter, but contained elements which were differentiated under the magic of selective staining by various reagents. And further, this body once considered so simple proved to be the subject of minute elaborate changes. And now that in the chromosome we seem to have found an actual structure which we might once almost have believed to correspond to an element of hereditary plasm,[1] we are only thinking concerning the chromosome, what we formerly thought concerning the cell itself. And in time to come, the chromosome itself will become the subject of further division and examination. Nor is there any reasonable prospect, through all this wonderful growth of genuine knowledge, of arriving at the morphological or the physiological unit of living substance.

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[1] The number of chromosomes is said to be always an even number. It varies greatly. In *Ascaris* it is 4 or 2, in *Artemia* (a crustacean) it is 168.

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[1] It should be mentioned that it is not so held to be equivalent by Weismann or any other investigator.

So far I have allowed myself to proceed in order to suggest the real and important nature of the actual observations which accompany the speculations on heredity. And I have allowed myself by the way to note what I am sure will be seen to be of importance—the tendency which this genuine work has by its very success, to put further from us any hasty acceptance of a supposed ultimate analysis of life.

Biology, like all real inquiries, is in its own nature and of necessity endless. It is only the research into a conventional *datum*, previously limited by our definition, which can be brought to a triumphant close by the acuteness of sufficiently equipped students. Thus the Law of Real Property, which is the product of human ingenuity, may be exhaustively examined and finally dogmatised by ingenuity of the kind which produced it. But it is the glory and dignity of Natural Science to be dealing with facts which are real and independent of human management, and which therefore of necessity lead inquiry into endless advances of communication with the other parts of reality. It is laughable when the ignorant in the name of Science claim irrefragable authority for its latest statements as if they were final ; but it is tragic when religious or literary criticism founds an objection against Science upon its movements and its changes, and does not rather recognise in these the witness of its real and not merely formal character, of its genuine contact with the universe. All inquiries into actual matter of fact are inevitably endless. Only let the point be remembered on both sides, and let the great work of real investigation and of honest speculation remain unsmirched by the insincere adulation of irreligious effort, which seeks in the sacred armoury of Science for weapons to use in its own ignorant spite against the ancient tradition of Religion and the native convictions of the soul.

To return, the studies in heredity have yielded great results, not less great because they are provisional ; and in consequence some degree of further interest in these subjects has been awakened among large sections of the public. With regard to this, some distinction must be laid down, a distinction between the popular conclusions which are often reflected in literature and in the drama, and the legitimate anticipations which are all that the more careful students have allowed themselves to entertain. Some of the popular conclusions have been extreme and one-sided; and, what is still more strange, they have been very nearly directly opposed to the prevailing opinion of scientific men themselves. Thus, for example, we are aware of a great tendency to attribute a morally compelling force, a force morally compulsive upon the offspring, to the action of parents and ancestors; and these actions at the same time are regarded as original efforts of the ancestor; and their evil consequences to be fresh importations to the family stock. That is to say, the inheritance of acquired characters in matters of morals seems to be almost a dogma in popular modern thought, just at the very moment when biological Science finds it most difficult to accept such inheritance even with regard to physical characteristics.[1]

On this point I shall not follow any farther the various forms which the doctrine of heredity has received in popular thought; nor again, can it be my work here either to set forth the provisional conclusions of different schools of biologists on this matter or to indicate my own preference among them.

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[1] Tennant's *Origin and Propagation of Sin* is the work of a writer accustomed to the exact methods of science. It may be reckoned, however, as a book outside the range of regular biology, and among such books it is remarkable for its full appreciation of the improbability of the inheritance of acquired characters, the author finding indeed in this improbability a difficulty for the doctrine of original sin; and for its clear recognition, rare even in books of biological speculation, of that social inheritance which, as we shall perhaps have time later to show, makes the case of the social organism widely different from that of any living body to which it can metaphorically be compared.

At present, what I have to point out is the importance of these speculations for Religion, remembering always that Religion is concerned not only with faith but also with practice. The interest, then, of these investigations for us of the Christian camp, lies in their supposed practical bearing. And this practical bearing is of great importance for all who teach, and not least for the clergy whose opportunities of teaching are so great and so varied.

For teachers, then, for those who deliberately influence their fellow-creatures, for men concerned with education in its widest sense, the theories of heredity are of importance in two respects; and first because they may affect the basis in thought of personal effort and of the training of individuals by others. They may affect, that is to say, the springs of virtue, the motive power of education. They have a bearing upon what the man endeavours to do with himself, upon what the man endeavours to do for his children, for his scholars, for his hearers. There is one chief line of practical inquiry.

And secondly, these questions and these provisional conclusions, most of all, these hasty popular dogmatisms—and that (note this point) whether they be true or untrue—have a real bearing as accepted statements, may have a fatal or mischievous bearing upon those mental conditions which concern the progressive improvement of society, and especially upon efforts to ameliorate the lives of the poor. Let me make this last point again. Truth, we know, will prevail; but falsehood also has its time and power, its power for mischief. Therefore we must not conclude that because certain opinions are merely in the air and have no sure foundation in facts, no justification even as probable in the authority of living Science, that they are as opinions unimportant and inoperative. What is in itself "the baseless fabric of a dream" destined soon to pass away, may leave permanent results, if during the period of its prevalence it has been able to affect the springs of moral action, though it be only as a lie which has paralysed or misdirected the energies of men of good will. I do not say that our present provisional conclusions are false; I do not say that the wildest popular dogmas may not finally be justified; nor, on the other hand, do I say that they have necessarily any serious importance as theory. What I desire to point out concerning this special matter is that, however little this or that notion may finally bear the test of argument, it can, while it lasts, create results of the most vital reality. There are some theories which have an astonishingly small effect upon human life. How little difference it would have made to Thomas and Jane Carlyle, so far as we can at all guess, if either of them had believed in ghosts. How little trace in all probability it would have left in their lives if either or both of them had been actually haunted; nothing compared to the happy change which would have been effected in Cheyne Walk or wherever those linked geniuses spent from month to month the suffering life of genius, had there been added to their shining endowments the humbler privilege of health.

But there are other theories which, quite independently of their truth, leave a deep mark in the lives which once accept them. A hasty conclusion with regard to heredity, either as it affects the question of personal effort or as it affects the progressive improvement of society—a hasty or extreme conclusion with regard to the place of heredity tends to rob us of hope and to weaken our effort. The anticipation of failure may be powerful in producing it; and it is noticeable that the gloomy thoughts about inheritance are those which are most often expressed. It is to excuse wrong actions that the plea of heredity is urged. The bad man in Tennyson's play is ready to blame his blood—

> "This mortal house
> Which we are born into, is haunted by
> The ghosts of the dead passions of dead men;
> And these take flesh again with our own flesh,
> And bring us to confusion."
> —*Promise of May,* Act ii.

What, then, let us ask, is the general tendency of this popular thought? It is surely that Science has made a profound difference in our conception of the facts of heredity; that we now know a man's nature and character to be determined by the nature and character, and in many cases by the action, of his forefathers; that therefore with regard to the individual it is useless for him to struggle against ancestral tendency; and that, with regard to the classes of which society is composed, with regard to the general improvement of our national stock, we ought to look rather to the elimination of the unfit than to the improvement of the individual, in order to raise the general social condition of the country. I am well aware how rough such a statement is, how much it needs qualification; but I am also well aware of my own tendency to enlarge in criticism and in balancing discretion. Let it therefore stand, as avowedly an unbalanced rough statement, but one surely which answers to our general sense of the thought which is moving about us. Now, what shall we say to all this?

First, it is no unimportant matter to remember that the facts of heredity are not new. Men talk as if the conditions of our life had been changed by the movements of Science. But what the hereditary conditions are now, that they have been from the beginning. And this carries with it the fact that if, in the past, effort has been fruitful for the individual or for society, it will be fruitful again in the present and in the future. The facts are not new.

Nor, *secondly*, is the conception in its main outlines new. It was always known that you could not make a silk purse of a sow's ear. It was always known that heredity was, for example, so strong that the children of men were men themselves; that the children of Englishmen were English. Nor was the balancing power of environment forgotten. "All deep thinkers," says Froude,[1] "know that their wills are conditioned by nature and circumstances, and that we learn to live and act as we learn everything else." Not only the facts therefore of heredity, but the main conceptions which are now so largely preached, just so far as those conceptions are sound and unshakable, have also been known all along.

Thirdly, and for example, we have always known that race was a most powerful element in shaping men's lives, a most important conditioning factor, perhaps the most important of all. "Even the homely farm can teach us there is something in descent."[2] But we knew, or ought to have known, that race was a factor acting along with others among which might be numbered individual effort, the movement of the mysterious will, influences of education and training, influences of circumstance, the Grace of God.

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[1] *Erasmus*, p. 329.

[2] *Locksley Hall Sixty Years After.*

We knew also how permanent and how important was the influence of certain special strains; how, while we are all the result of the whole of our ancestors, there are some bloods which are prepotent, and show themselves vividly wherever they are mingled with the less remarkable and apparently less constant strains. Norman blood, distanced by simple faith in the race of excellence and virtue, is nevertheless in advance of it in its effect upon the features and the manners. The descendants of James the First received, we are told, their peculiar distinction of appearance from Anne of Denmark; Caroline of Brandenburg-Anspach, the wife of George the Second, brought in the aspect and mould of features which distinguish our reigning house from the other descendants of James the First. From Augusta of Reuss-Ebersdorf, her maternal grandmother, Queen Victoria believed that she inherited those powers of mind and talent which she possessed.

But these illustrious instances find their parallel in every family. And moreover within the family it is recognised that the noted features—the Austrian lip, the distinguished nose, the genuine eyes—recur with a surprising want of uniformity, and that where they occur they are apt to carry with them features of character and temper. In order to make our discussion anything like complete, we should be obliged to examine these questions at great length. Here I only mention them in order to illustrate the fact that ideas, and definite ideas of heredity, are not at all new even in modern thought; that they ought indeed to be the familiar furniture of every thoughtful mind, and that we might indeed hope by pondering over them to disentangle among them certain truth from probable, and probable truth from certain falsehood. And further, by comparison of the utmost conclusions possible to us from the stubborn facts of experience, we ought to have learned how small a part these thoughts can at present claim in the direction of conduct. We might illustrate further the notorious fact of the enormous dissimilarities which exist within the family; the extraordinary disparity in quality and in skill of those who share the same characteristics; the sudden degeneration of proud houses; the recoveries of the dwindled representatives of our ancient English stock in wider circumstances of freedom, of more constant and better rewarded industry. And we might set alongside with this, not indeed, as a common fact, the sudden collapse of strong national races, though there are some instances of this, but, first, the remarkable changes in the direction of their activity and the consequent modification of their characteristics, as in the case of Germany and Italy; and secondly, and in a contrast what is so much sadder, the existence of deplorable sections of otherwise strong nations which appear at first sight as if they were weak and degraded strains mingled in the current of the strong national life. Men ask where we breed the unemployed, as if they were a kind of racial variety carried along and artificially preserved by the general strength of the proud blood which they share.

These and other circumstances I mention simply in order to show that the conception we have to deal with is old, and the materials for a conclusion, however modest that conclusion, have to a very large extent been before us in the past. What then, we proceed to ask, has Science actually done to our modern popular thought? First, it has directed our *attention* to these things; and of all the themes of psychology none is more important than that which deals with the fact of *selective attention.* The facts which are not within the range of men's conscious thought are often largely inoperative; as thoughts focus the mind upon them they take on again a weight, perhaps larger than they properly deserve.

But in the second place we have to report a definite change. Science has overcome, or strongly tends to overcome, our scruple about connecting mental and moral characters with outward ones. In old days I think we very largely believed in the strict inheritance of certain qualities, but excluded from our list not indeed all mental qualities but at least those called specially moral. I am not now trying to show how far the breaking down of that division is justified. Presently I shall have to show that a barrier still exists, that something there still is outside our range. I merely indicate the nature of the change which our idea has undergone. It is indeed in including the moral sphere that the notions of heredity have been active and triumphant. The modern belief in heredity is not largely a belief in race. That has rather fallen into the background. How could it be otherwise, when we see so many persons of ancient honour in lowly positions, so many who cannot tell their grandfathers numbered among the great? Briefly, then, there has been an increased belief in heredity in so far as it is the rival of morals, a decreased belief in so far as it was a warrant for distinction. And these two tendencies have found a point of union in an increased belief in what biologists call the 'inheritance of acquired characters.' We have, that is to say, a strong belief in *heredity on short reckonings*.

What should be the work of every thoughtful man in view of this state of opinion? First, to attempt to arrive at a clear view of the surface facts. Secondly, to disentangle our notions about the inheritance of acquired characters.

Thirdly, to show what, on general grounds, remains the place of moral effort in view of all the known facts. All this will tend to show that in the light of our old convictions—where they stand fast—and of our modern knowledge, the field of moral effort, both for a man's self and in all his dealing with individuals, remains the broadest field we can conceive, and that the place for Religion, for Grace, is unhampered.

When this point is reached, there is a proof to be worked out, and materials for the proof, that human life, even on the conditioning side, even on the side which has the character of necessity, is in a different position from life in general; to show, that is to say, that there is for us another link of descent besides the physiological link. This done, we should be ready to consider the problems of society, which will in fact be slightly touched in another chapter of this book.

The first task, I said, of ordinary thought must be to endeavour to obtain a fair view of the surface facts themselves. I write this in full memory of the great labours of Galton and others, but also not forgetting the extraordinary tendency, when we are confronted by certain questions of cause, to leave unchallenged the *facts* alleged. Every one remembers Charles the Second's question to the philosophers of his day about the fish and the full vessel, and how long it was before the fact presented for explanation was made to answer for its own existence. There is no range of questions in which there is a more profound difference between the man of practice and the man of Science than there is in this question of heredity. The practical man and the practical woman believe profoundly and precisely those facts with regard to which Science has never been able to find satisfactory proof of their mere occurrence. Before, therefore, we allow ourselves questions of mode and reason, let us ask what we actually observe or what actually lies within an easily ascertained knowledge. One fact, immensely forgotten, it seems to me, is that everybody has not only a father but a mother, and that behind each of these parents lies an equally important range of ancestral influences. The effect in this matter of the use of names has been very great. Over in Germany they look for sixteen quarterings; here in England our test of gentle blood, so long as we still retain a test of descent, looks simply to the male line which gives, in contrast to the use of Spain again, the invariable surname to the family. Family is for us the sharing of a certain male descent, the sharing of a common patronymic. This leads us to forget that the so-called female line is just as important as the other, that the family might just as well be reckoned by a common ancestress, and that this ancestress 'brings with her,' as our common language speaks, not a solitary influence but an influence equivalent to that of the great grandfather himself. In the case of illustrious houses where all the alliances are famous, the female strains are noted, as we saw above in the case of Queen Victoria. But ordinarily it is not so, and even when the ancestress is renowned it is thought that Ann or Caroline contributed a feature to a stock which was, in relation to her, as a river is to a rill. It is not recognised that the whole past which lies behind the lady who enters the family becomes the past of her new family; that all French history, for example, entered our Stuart strain with Henrietta the mother of Charles the Second and James the Second, just as surely as the whole past of a highly cultivated race enters (not as cultivation but as a disturbing element) into the heritage of what we call the African child of a mixed marriage. If the new strain does not show its influence at once, it may later. If it does not, it is because of the pre-potency of another strain, not because of a family name; and the wonder is not, when the new stock does not show itself at once, but when it shows itself in the likeness of the wife rather than in the likeness of some remote ancestor of hers. I have said enough, I think, to indicate the vast complexity of the common facts of human hereditary characteristics. Indeed this simple fact, that we had grandmothers, and that the female line contains just as many male elements as the so-called male line (which, like the female, is half composed of women), yields us a measure of hope, ought indeed to spur us to effort; for it shows how many and how various are the possibilities which reach us from our ancestry. We say of this man or of that, he comes of a drunken stock, a drunken father, a drunken grandfather. But remember that if he had drunken ancestors, he had innumerable sober ones also, and that it is not always the nearest forebears or even the nearest examples which have most influence. "Archbishop Leighton, an honour to his church, his country and his kind, was the child of one of those firebrands who kindled the Great Rebellion."[1] And remember, further, that at a certain period of our race's history, the ancestors of the majority of us were drunken. If such characteristics as these leave an indelible mark, how is it that England came through the eighteenth century at all? To speak of a bad strain is to use the most short-sighted judgement, is to point to that which in the view of physiology is almost inconsiderable, a brief period of history imperfectly traced along one particular line, and discovering elements of disadvantage which, if all lines were traced, would be found common to every living man. Or if this be considered too extreme a statement, if there are some who would challenge my conception of facts and who think that strains absolutely pure from every avoidable blemish are common among the families, say, of England or France, then let me press farther back still and ask whether any of us can avoid the disadvantage of descent from the Sea-wolves of Denmark and of Norway, the pirates of the Elbe, the downtrodden slaves of Cornwall and Sussex. Or, if, as indeed is the fact, that ancient savage history within our ken had in it elements of strength which might well overpower its undoubted vices; what, I ask finally, is the use of fearing this or that strain of the blood while we disregard that more lowly and more discreditable ancestor of us all, the beast that is within us every one; the flesh ruled by appetite and obvious impulse, the selfish savage, ancestral, but continually modern, who is ready, when moral restraint has relaxed, to make his way through the polish of every civilised man?[1]

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[1] Southey's *Doctor*.

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[1] It is to go outside that part of the subject which I have chosen, but I will here make sure of mentioning the great possibilities of attention, the power of training which is shown in the daily conflict of the moral man with the immoral forces within him. May there not be a power in the will to bring out and to realise this or that element of family character? What is the meaning of the gallant air of this man, the mechanical gracelessness of that? Their blood is probably pretty equally mixed. In the noble there are plebeian elements brought in at many points of the family history; in the mechanic there is a share, probably, of several distinguished strains of blood. But on that mixture, see how the circumstances tell. The one man is fine, the other without fineness. But the fine circumstances do not make the fineness of the fine; they foster the fine elements which are already present, give them room for expression, and without those circumstances the elements of

Surely more important by far than any particular bad strain is the foundation of merely animal life which lies below every one of us, whether happily or unhappily bred and nurtured —the "unfailing aboriginal democratic old monster that waits to pull us down."[1]

Against this monster the truer life, the life which is more than animal, fights continually to survive. It is only in effort, constantly renewed, and, though falling, rising again and making for victory, that the higher life exists at all. However select the strain which we know in its few penultimate steps, it has always the general enemy within nature to beat down, all other enemies apart. Nothing but watchfulness and courage can save the man who comes from choicest opportunities of preparation to the open field.

The common foe of best and worst is the most formidable foe of either. Nothing less than constant effort is enough for safety in the most fortunate case, the happiest nature conceivable. And this effort as—under conditions—it holds off the general menace of the old monster, so—under the same conditions—it will be enough to

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gentility are unrealised. The library will draw into resembling his student ancestor the boy who otherwise would have remained without token of a share of learned blood; and yet sometimes the blood is so strongly masterful that it will break out through all difficulties.

[1] Meredith, *Diana of the Crossways*, p. 14, ed. 1892. (Chapman & Hall.)

hold ground against the special evils which are found in the last few steps of known descent.

For all the known descents, immeasurably important as they are in virtue of influence, of example, of chosen opportunity, are when physiologically considered insignificant *in comparison* with the racial steps common to us all and which stretch behind the farthest known point of special kinship.

None need despair of taming some ancestral badness when we remember that all and each must dominate the old man common to us all, witnessed to by science quite as much as by faith. Each man in his turn before us has fought this fight. There in the chancel, in alabaster,

> "Lies the warrior, my forefather, *with his feet upon the hound.*"[1]

The hardest battle against interior evil is the universal human story made intense for each. We have will within us for the task, and Grace.

> "Cast the poison from your bosom, oust the madness from your brain;
> Let the trampled serpent show you that you have not lived in vain."

The real danger of an unbalanced apprehension of the new doctrines is in the discouragement of effort,—"Have we risen from out the beast, then back into the beast again;" in the paralysis of the will which ceases to covet that power of God's will which can alone make our efforts effective.

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[1] *Locksley Hall Sixty Years After.*

Our general view of the surface facts needs disentangling thus in the light of a much more complete memory of the actual conditions under which we live. The mere recognition of our ignorance of hereditary predisposition is enough to contribute a real motive to hope; for no man knows that he has not the element necessary for success, and he may therefore aim at the success which will in his winning realise the elements which entitled him to it. Every one of us has had many virtuous ancestors. Granted that the vice and folly are, as such and in particular, handed down from father to son, we have a good right to strive by appropriate conduct to bring out the power of the good, to re-present the good actions, self-denials, acts of courage, which have also on this theory contributed to the fabric of our inherited character. And for others—we must be patient with other men's faults as with our own; we must never despair of any character, but remember that of the different qualities, not all come out upon the scene of individual life at once; that the weak side having been represented, there is sometimes means to bring out the strong. Faults of early life may in their merely physical foundation be a kind of re-presentation of the ancestral savagery, and will give place under the proper discipline of Grace to an age of chivalry and an age of social responsibility. It is the business of hope to seek for those grounds which plainly lie before us of trusting the personality which lies behind the circumstances, and the Grace which lies behind and below personality, the greater life of the New Adam.

CHAPTER XII

SOCIETY REGARDED AS AN ORGANISM

Another line of thought which has a practical interest for leaders or teachers of men is that by which biological guidance is sought not simply for individual lives but for human communities.

Certainly among the gains of what we may call the biological period stands the renewed attention to the corporate view of society. The old word 'body' is replaced by the word 'organism,' as suggesting more clearly the nature of the body-politic, society. The study of the body at large has quickened the study of this body-politic; and extended theories about the origin and the interests of ordinary bodies have provided at any rate a large mass of suggestions with regard to the origin and the interests of society. And yet the notion of the analogy between these two is one which, before we accept it as a guide for conduct, needs a great deal more examination than it has yet received. It is indeed a little astonishing that a notion so warmly welcomed, and in certain senses so fruitful, has been applied with so very little of critical discrimination.

Is society then in any sense an organism? Most of us, it is to be hoped, are inclined to answer this question in the affirmative, and moreover to count the answer among those which hardly need to be proved. It does not stand to reason, but it is rooted very deeply in our natural habit of thought. Looking back we seem to find no time when this notion, that society is a body, was not at any rate implicitly believed. Men have needed over and over again to be recalled to the obligations which it implies. Its implications indeed are perpetually forgotten, but they are recalled as implications belonging to an accepted premiss. The mere fact that we fail to do our duty by society as a body does not go any way towards proving that we do not believe it to be a body; for with regard to our own actual bodies we exhibit exactly the same neglect of plain duties. I am inclined, therefore, to think that all along, silently, perhaps unconsciously, a notion has been entertained that at any rate the particular society in which a man lives is in some sense a vital whole embracing his own individuality in a larger single life. To this notion St. Paul seems to appeal with confidence. He does not prove it, but enforces some of its consequences. And when Menenius Agrippa declaimed the fable of *venter et membra* to the mob at Rome, he prefaced, Shakespeare says, the pretty tale with: "It may be you have heard it."

Society, then, we may suppose—admitting wholly that all our terms need a great work of definition,—society is in some sense or another an organism. We may in some way apply that knowledge which we draw from the study of animals and plants to the elucidation of the problems of social life. Just as the cells morphologically comparable to single Protistæ are associated together in vast numbers and many varieties, so as to form one animal organism which has an individuality far more important than the total of the lives of the cells, so also we may conceive the association of individual human lives as the basis of a true corporate existence transcending and co-ordinating them all. But what is this society which is truly an organism? And how do the laws of this organism compare with the laws discerned in the life of a tree or a horse, or of a man in his animal aspect? Here we find ourselves at once in a maze of unsolved questions; and though we cannot solve them, something may be effected if we can set forth with a measure of distinctness some of the various questions which arise.

I. To begin with, we have to determine the place of analogy as distinguished from several other things which are not analogy.

1. In the first place, apart from all analogy, a

collection of men is *actually* a physical and biological fact. The laws of the animal life hold here just as surely as in any other collection of animals. We have the animal life of each of the members, the physiological problem therefore of each member; and you have the aggregation of all these animal lives presenting a great mass of physiological questions.

2. But then, besides all this, we have a new and yet actual physiology of the society, an animal fact in the associated animals. When a number of men are gathered together we get physical and physiological problems which are something more than those presented by the mere sum of the separate physiological facts. When you have determined the conditions of the health of one man, and of eleven other separate men like himself, you have by no means discovered the conditions for the health of the twelve living together in a confined space, even if that space is twelve times the size of what is required by each one. Their mere association produces new physical and physiological conditions. Here, then, are two things which need to be allowed for and considered before we can advance towards the consideration of that *analogical* physiology which belongs to society regarded as a social organism.

3. But supposing, thirdly, we could complete that socio-physiology, the laws of that life in

which institutions and traditions are the blood and sinews, we should go on to further and much more fanciful approaches to likeness between the body and the society.

The same series may for some purposes be better considered in the opposite order. You have then in the lowest place a merely figurative analogy rhetorically true, which may be used for a certain purpose and laid aside when it no longer fits. By such a figurative analogy we speak of the military resistance of the Boers during 1902 as having that persistent local vitality which belongs to a low degree of organism. Here you have a perfectly justifiable figure of speech, but only a figure of speech. Nobody would contend that it is to be pressed as if an actually working quasi-physiological law might be found in armies as such; nobody had a right to be surprised, for example, when, in some important respects, the Boer military forces proved to be most highly organised. The figure might still have served its turn.

Quite distinct from such a figurative loose analogy, there might in time be found with equal truth a just and accurate analogy which would move all through, and would hold good as a guide and not merely as a means of expression. This would reveal the social organism itself comparable to a physical organism with actual laws of reproduction, nutrition, survival.

This analogy, which is the object of our search, is distinguished on one side from mere simile, and on the other from what is not analogy at all, but the strict continuity of physiological process and problem into the life of man as well as of other animals.

Finally, to return in reverse order to our starting-point, there is the physical basis of the life of every single member of the most highly organised society.

It is difficult to clear these things up even in language, but if we are to make any progress in the construction of a socio-biology, a law of the rise and decay of states on the analogy of animals, we must disentangle it first from these matters in which animal life is actually operative in its own character in society; and also from these merely figurative expressions which are useful in order to convey a certain view of social phenomena. Here, then, is the first source of confusion in such inquiries as we are speaking of.

II. In the second place, it is extraordinarily difficult to determine the *area of social life* which may be regarded as one organism. Is it a national individual such as Hobbes conceived? Or must we take the nation itself to be a limb of some larger unity? Is it one whole generation that we are regarding as a descendant from the generation before? Or is the state in the entire course of its history thought of as a continuous individual? Here, obviously, are endless sources of difficulty. We may indeed think of the whole life of mankind as that of one tree living continuously from the root to the twigs; or we may regard it as such only during some particular space of time as an individual descended from other individuals. And, further, even if this question was determined, the greatest possible care would have to be taken, in applying biological notions to its study, to distinguish those conclusions which are drawn in biology concerning the individual and those which have reference to the development of a stock or race — the specialisation of a species. That is to say, *we have to distinguish problems of phylogeny from problems of ontogeny.*[1] I do not in the least forget the difficulty of making this distinction; but I contend that the difficulty should be fully recognised, and, in consequence, the greatest caution used in all theoretical conclusions with regard to society. A still more jealous care is called for in regard to all conclusions which are practical.

In such applications of biology to social study as we have hitherto received, I do not think this distinction between ontogeny and phylogeny has been maintained with nearly sufficient clearness. You have an argument which begins by the recognition in the state of changes which are held to be comparable to the changes observed in the development of an individual living form; interests which are supposed to be parallel to the interests of a single living creature.

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[1] Ontogeny is the growth of the individual from the germ. Phylogeny is the descent of the species from a less specialised form. Baldwin has annexed the word development to the first, and the word evolution to the second.

But later you are met with considerations which belong *directly*, not to the individual life as a continuous growth, but to the evolution of a species, a modification through descent of a long series of individuals so as to pass from one type to another.

Now in this transition from ontogeny to phylogeny there must always be grave difficulty. But when the transition is *unrecognised*, the difficulty becomes a perfect certainty of mistake. Let us take a definite example. The specialisation of a type or race depends upon the action of Natural Selection winnowing away individuals through a long series of generations. The advance therefore of the race as such —the special advance of which alone biology takes account—depends upon the rigour of the elimination of individuals. Improvement in the widest sense is not secured by Natural Selection. But divergence is secured, and the particular direction of divergence, which produces a type fit, in Mr. Hobhouse's admirable phrase, to fill one of the *lacunæ of organic possibility*, is determined by the incidence of competition and mutual strife. Now, is this the case in the development of an individual from the germ? Only in the most fanciful sense. There is no sort of proof that the various cells of different parts of the body gain their form by anything like a Natural Selection within the body. Their divergence is predetermined by a law of growth existing in the original germ. Eimer, in one extreme, made a good attempt to show that the variations of animal type were due to a similar quasi-original tendency, a "Law of Life" in the whole organic population considered as one being. And, in the other direction, M. Roux, Pasteur's great assistant, has suggested *a struggle for existence within the organism* by which the form of various structures, he thinks, has been determined. But most naturalists would admit, and more than admit, that M. Roux's intra-organic Natural Selection is little more than a poetic method of expressing the laws of growth, unless it is an ultra-Weismannic effort to explain every feature of life, at whatever cost of additional hypothesis, without admitting the notion of direct effect of forces and conditions upon the organism. M. Roux, if I remember rightly, would ascribe the disposition of elements in a bone so as to meet its mechanical stresses as the result of competition inside the body, but, as I have said, most naturalists would regard M. Roux's suggestion as brilliant indeed but partly fanciful, and

Eimer's suggestion of *Organic Evolution* as a forced reading of the facts. Roughly speaking, Natural Selection stands out as the *guiding* factor of the descent of a *species* by modification, and a *law of growth* remains the symbol for the inward directing force of an *individual* development.

Now when society is regarded biologically, the principle of Natural Selection appears sometimes in the mid-course of an argument in which society has all along been considered as a continuously living individual. Here the analogy of Natural Selection has no place. But in this and in every other point which might be added on this head, it is much easier to point to the sources of confusion than to determine the limits of the society which should be regarded as an individual, and thus to make the first steps towards remedying the confusion. Let the confusion, nevertheless, be recognised. Phylogeny and ontogeny are, indeed, two parts of the same truth, and are inter-related, but the one is not the other.

It is exactly the task of biological inquiry to trace their continuity, and to show, as Von Baer, for example, showed, or rather assumed and suggested, the degree in which the individual recapitulates the story of his own descent within the limits of his life-history; the degree, that is to say, in which phylogeny lies parallel with ontogeny. It is the task, we say, of biology to show this, but not to assume it. And if in the parallelism of occurrences we could show a continuity of law, yet when this continuity was quite clearly displayed, the greatest possible difference would yet be made for any social inquiry by the selection of one point or another in the biological series as parallel to a given point in social history. Let us by all means compare the two lines of facts as wholes, but do not let this suggest that so long as the wholes are laid side by side it does not matter whether the ends are reversed or not.

It cannot be pretended that the discussion which is suggested above would prove to be a simple discussion, easily followed, easily shared by men without technical training, or who had not patiently studied the principal writings on the subject, or considered at first hand the complicated appearances in question. To have alluded to the matter may, nevertheless, not be useless. For it may be sufficient for a conviction that the analogy from organic life, while it is of unquestionable value for the *illustration* of known facts of society, cannot as yet be used with safety for ascertaining facts otherwise unknown, or for discovering the unseen causes of effects.

Here, then, we leave our subject in mid air. And if we have attained a sense of its immenseness, the labour of reading these pages will not have been wasted. We have just touched the beginnings of thoughts which lead out to all the problems of individual conduct and of social progress; and we are made conscious of the great task which is offered to all Christians who have entered upon natural studies, the twofold task for thought and for obedience.

For obedience the task is not unfamiliar, though it needs continually to be undertaken as if new. For thought it is the task of maintaining old knowledge at a time when new thought has many happy characteristics, but when some of the happiest of them are accompanied by special danger. The note of our time in thought is inclusiveness; but we must be careful while improving the synthetic aim, not to lose the distinctness and the distinctions of reality. Of old, Grace was thought of as real mainly, or even only, as being apart from nature, and religion as venerable because it was something diverse from science. A new vision of the sacredness of nature has given men an impulse to state in some more inclusive way the value of grace and revelation. While we welcome the hopeful temper of this effort, we have to learn how to maintain in fresh circumstances of thought the transcendence and the unique character of God's spiritual revelation, the sovereign power and the sovereign claim of His Grace and Law as given to man in Christ.

APPENDIX A

ILLUSTRATIVE NOTES

1. NATURAL SELECTION

NATURAL Selection, it was said above,[1] when it strongly attracts the mind, runs some danger of becoming a kind of academic formula rather than a real explanation.

Every simple addition may be expressed as the resultant of a supposed double process of addition and subtraction.

b (a known quantity) $= x - y$ and $a + b = a + x - y$.

Similarly, every organic new arrival (of specific form, or adaptation, or functional organ) may be described as the result of a process of elimination. You have only, in the first case, to suppose a sufficiently large total addition, from which by subtraction to arrive at the actual increment; and even if the subtractor is known and cannot be arbitrarily diminished or enlarged, x can always be made large enough or small enough to provide exactly for b. And in the other case, that of organic change, if a logical explanation is all that is needed, you have only to suppose a sufficiently large total of variation from which by elimination to get (in formal explanation) your known resultant phenomenon of life; and this would be the case even if your subtractor, the extent of your process of elimination, were known and measurable, which it is not.

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[1] p. 64.

What is to be guarded against is the mere gratuitous imagination of x, the gratuitous imagination of the larger range of variation on which elimination is supposed to act.

I venture to give expression to this warning in contradiction to my own prejudices in natural history. I have referred to this matter above (p. 64), and may here give it some illustration.

The conception of natural selection, describing a given result as produced by elimination acting upon wide variations, was thought to be inapplicable to many instances of specialisation which were attributed instead to the direct effect of the environment upon the inherent energies of the organism. Such instances will be found put in order by Mr. Spencer. A convenient case is the diminution of the jaws, teeth, and biting power of some pet dogs. The other most popular instance, the diminution of flight muscles in tame ducks, disappears, I believe, on examination.

This diminution is attributed, in what is conveniently called Lamarckian doctrine, to the direct atrophy of organs which cease to be exercised.

But in the Selectionist view they appear as cases of the *suspension* or even *reversal* of natural selection. It is conceived,—the word conceived is used provisionally, and we return presently to the point involved—that dog-nature varies continually in all directions; that the jaw apparatus in the offspring of any dog varies in strength on either side of a mean strength.

Further, that under the stress of natural competition, involving in the case of dogs not only the deglutition of hard food but also self-protection and the killing of prey, only those individuals survive whose jaw development is above, or level with, the necessary mean.

Further, by constant destruction of the individuals whose development in this respect falls below the survival-mean, the level of the mean itself is maintained or even raised. The average itself becomes automatically higher, by the preservation of the higher terms of the series, and the exclusion of those individuals which show the lower development from representation in the following generations. According to the severity of the competition, the needs of other balancing qualities, and many other variants not now to be enumerated, the survival-mean in respect of a given organ is determined by natural selection. Under nature therefore, or under that ordinary dominion of man within which the dog has in general to earn his living, the dog jaw is what we commonly see it to be.

But in the case of lap-dogs or dogs preserved on account of their singular aspect, this part at least of natural selection is suspended, including both the true natural selection which oppressed and educated canine-nature in the rough to become the dog-species, and also that modified force of natural selection which ordinarily falls upon dogs as we know them under that tutelage and benevolent tyranny which man exercises subject to the suzerainty of nature.

The lap-dog will be kept alive without regard to his usefulness, or rather because of his special usefulness as the companion of our drives. The bulldog who cannot hold, the Skye whose incisors are not in apposition and tumble out, the pug whose face is his fortune and was never able to bite, shall have their food crumbled for them if they grow thin on food that's hard. There is a suspension throughout their generations of natural selection in this respect. That is to say, there is no elimination of the individuals which are, with respect to jaw-power, unfit for the rough and tumble of life.

Consequently the process is suspended by which those variant forms were formerly eliminated which fell below the mean in respect of biting powers. These inferior variants now have an equal chance with others to be represented in the following generations; and the mean itself, the average biting-power necessarily falls. There is a suspension of the former natural selection, a cessation of those influences by which the strong jaws were kept on the plane of actual existence, and the weak jaws 'went out.' Thus the newly appearing weak jaws are not a truly new result of the action of the force of atrophy. They simply represent the new *survival* of forms which were always potentially in the general list of the stock production. If a new master at Crichel gave up the graceful preference for a white farm, speckled hens and pied pigs might soon appear in the stock; for few strains procured by artificial selection breed quite true for long. But the new dark patches on the snowy backs would not be due to the direct effect of the owner's will, they would not be in a deep sense new productions, but the evidence of a new *toleration* extended to qualities always inherent in the various white breeds; a case of the suspension of human selection, human elimination. The weakened jaw of the pug is a result, we conceive, of the suspension of natural selection, a new toleration of what was always inherently possible among the dog-variants.

This may serve as a suggestion of the suspension of natural selection. But we may further suppose its reversal. When an organ, or the strength of an organ, ceases, by reason of a change of circumstances, to possess survival value, it is not only of no advantage to the creature to maintain it, it is of positive advantage to lose or to reduce it. There is the positive advantage of economy. The animal system has no more force than enough for the various calls made upon it. If one of these calls ceases to operate, there will be a distinct and positive advantage in ceasing to meet it, for the energy thus saved may be used in other channels. My business required that I should keep a boy and pony to carry messages and small parcels to the post-town near by. But when the line of tramway was laid past my door, I put down the pony; and what is thus saved enables me to make a modest plunge into advertisement, a development which the nature of my business always inherently required, but which could not till now be actual for lack of means. It is not only the fact that the *pony* is no longer required and therefore *need* not be a feature of my establishment. More than that, his *disappearance* is required. Since he is no longer functional he *must* not be a feature of the establishment. In like manner the teeth which no longer munch not only may go but they must. They do not remain a feature of the organism; and this is because natural selection is reversed and the energy saved is expended upon the development of other potentialities which are at a premium in the new state of things.

Whether this is true or not about the pug, it will serve to show after what fashion selection may most hopefully be discerned in cases of adaptation which are otherwise ascribed to the direct action of the environment.

I am tempted to add another case where the popular thought of direct-effect—for all popular thought is naïvely Lamarckian—is very directly and, I think, very successfully challenged.

The trek-oxen and other domestic cattle of South Africa are descended from European stock. They possess, however, at least in many cases, a feature which distinguishes them from our cattle, namely a considerable hump at the point where the neck meets the shoulders, not so prominent as the humps of Indian cattle, but a large mass of muscle and fat which is one of the regular joints of a South African luncheon.

If a stranger asks for the cause or the origin of this important character in African oxen related by blood to our own almost humpless breeds, I venture to guess that in five instances out of ten the naïve Lamarckism of agricultural thought will reply that the development of the hump—we may be popular, but we have the word 'development'—is or was caused by the pressure of the yoke. The oxen of England no longer plough or drag the travelling wain. For hump they have little more than withers. Their congeners in Africa inured to the trek have produced, in response to the yoke's pressure, a hump on the shoulders to meet and fix it. Certainly the hump is of great service as a strong pad for the yoke, and if it were absent the trek-oxen must be harnessed in some other way, perhaps by the horns, as (in spite of their humps) some of the cattle of India are. But from this fact it is a long way to the admission that the hump has been evoked in a century or so by the action of the yoke; and become *through the yoked individuals* a characteristic of the whole breed.

What is the selectionist account of the matter? In selectionist doctrine it would appear, I imagine, as a case of a renewal of natural selection, in respect of a certain feature in a stock which *in respect of that feature* had enjoyed a suspension or reversal of natural selection. It is a re-reversal of selection.

The hump, so far as its natural function is concerned, falls into a class of structures all useful for the storing of nutrition. Such are the adipose sheaths and masses of mammals in general, the broad fat tails of sheep, and the humps of camels. Where these structures are large and special, as in the last two instances, they belong to animals whose natural habitat or whose survival by escape from pursuit makes a portable store of food especially important. The camel crosses wide deserts without a chance of food, could not cross from food to food unless he carried along with the water in his sacks also a store of food in his bunches. The sheep is a mountain beast, winning a rare pasturage among steep and sunny crags. His tail is a prodigious store of fat. Savage men at the age when hunting is an inappropriate daily means for the satisfaction of daily hunger, begin to carry, or to sit surrounded by, layers of adipose deposit which may be replenished when fortune is favourable and are a readily available store when meals are missed. This ancestral habit persists in more favoured races where it no longer possesses survival value.

In quite a rough sense the same function belongs to the very thick spongy leaves of certain vegetables which grow in sandy deserts or by the seashore. In the second case, though the moisture of the air is abundant, there are few opportunities for the acquisition of water through the roots in the soil, on account of its impregnation with salt. The thick leaves retain not so much nourishment as water, and form a store for the long intervals between the times at which, at any rate through the root, the vegetable can gain moisture. In the case of some plants of the veld and other sandy deserts, there is no absorption of water through the root.

The well-known Air-plant of South Africa by means of the storage of its thick leaves can live perfectly well when suspended by threads in the air. These vegetable structures may serve as a kind of parallel or illustration so far only as function is concerned of the storage chambers of animals. We have here a case of analogy and not homology.

It is conceived then that the oxen in a state of nature possessed considerably developed humps for this purpose of storage. Such humps exist, as we have seen, in the oxen of India. Removed into what is quite an unnatural habitat, the rich, moist fields of England, and later into the circumstances of stall-fed animals, the domesticated *bovidæ* wholly escape natural selection so far as the storage of nutrition is concerned. Consequently the humps become small in the course of descent, not by the direct action of the environment but by the abolition of the former premium upon such features.

When representatives of the family are transported to the circumstances of Africa which exaggerate the original difficulties under which it may be presumed to have reached its differentiation, the old need for storage is revived and even increased. The tendency, the potentiality of producing humps is still in the stock. It has not been eradicated by generations in which such humps were functionless. The acquired character of humplessness is not really inherited. In the renewal of circumstances in which such a hump is a distinct advantage for survival, the old tendency is actualised by the survival-selection of those individuals in which it tends to realise itself.

Consequently we have in the African oxen the reappearance of the ancestral hump now once more seriously necessary. It is a case of the re-reversal, the restoration of natural selection along the very same lines as those which governed the differentiation of this stock from some more generalised form of ungulates.

Our digression has been much longer than I intended, but I am writing for those to whom biological studies are not a regular employment. The illustrations I have given serve to show how natural selection may well be supposed to have covered cases of modification which were once attributed to other factors in evolution; and I think myself that we may still further extend the conception of natural selection if we recognise a value more subtle than survival value, and yet having a definite influence upon the chance of an organism for representation in future generations. I do not refer to sexual selection, of which I confess I see no proof, but to certain characteristics of natural life by which it is at least possible that the relative sterility of hybrids (the 'physiological barrier' of Gulich) may have been produced by an action precisely parallel to that of natural selection.

All that is good argument as I believe; and I have endeavoured to represent it as showing how truly natural selection may be extended to cover cases which usually receive another explanation. But for all this it remains true that we may push on a process of extension which looks like this until natural selection becomes little better than a *façon de parler*, as in some of the arguments of Weismann, and, I would venture to add, in the conception of Roux about natural selection within the organism.

How shall we distinguish the legitimate from the illegitimate projection of natural selection? By looking for evidence of the real existence of that wide variation which is conceived to be subjected to selection by a process of elimination, by a preferential destruction of some sort. What we provisionally called a 'conception' must be brought to the test of observation. There must be proof of the existence, or at least a collection of facts showing a strong probability of the existence, of the range of varieties supposed. We have something rather like the attainment of a special retaliation by the creation of a universal tariff to be modified by preference. Only, does the universal tariff exist? Is there actually in organic nature the wide variation which is necessary to make our explanation reasonable? Now in the instances I have mentioned we have plain reasons for believing in such variation. We have, in the first place, in the cattle of India, good reason for supposing that the hump belongs to the regular type of the bovidæ; for remember we have no natural wild cattle of our own stock to compare with those of our meadows. Again, in the case of plants there are numberless links between the highly specialised forms which flourish by the seashore, and others of the same families, which in different situations exhibit an absence of the peculiar water-holding structures. But we have no sufficient evidence of any sort of a tendency within the organism to throw off structures in all directions from which the right direction is arrived at by elimination. The fibrous constituents of bones lie from the start in the directions which are suited to resist strain. We have no real proof that cells are proliferated in every direction and are then wiped off along all paths except those which are necessary to the strength of the future bone. I think it is by the absence of evidence of the existence of the required variations that we distinguish the illegitimate from the legitimate extensions of the selection idea. But it can hardly be denied that it does become in certain hands little more than a kind of mathematical or logical formula by which every conceivable change in organic life is described as the resultant remainder of an entirely unproved excess of change beyond it; and *that* when neither the possibility of the excess nor the machinery of the selection have at all been made evident. Romanes' criticism of Weismannism will throw light, I am quite sure, on what is here urged. He shows that in a certain sense Weismann's theory is incapable of proof just because it is incapable of disproof. Now when once an expression like Natural Selection has become a formula it tends to be employed quite freely in what I should venture to call an algebraic manner; I mean that it is employed in various calculations without repeated reference to the substantial matters of fact for which it is supposed to stand. We have in consequence this unhappy result. Theory is branched and extended quite apart from any contact with real experiment, and its further developments land us outside of experience ; so that when we find ourselves once more in presence of actual life it is as though we awoke from a dream. There is a very serious dislocation in this way between the contemplation of nature and the elaborations of scientific theory.[1]

So far I have ventured to develope a word of warning against the reckless or too sanguine extension of theory ; but I cannot refrain from adding that, with all the weakness which may be pointed out in some of its applications, natural selection remains scientifically the most probable and philosophically the most welcome account of the adaptations of animal and vegetable life. I say 'philosophically most welcome,' for it shows us purpose in action. It is of all conceptions of the machinery of specialisation the one which is most consistent with teleology. So far from being a new difficulty for the idea of Design, it describes the only means hitherto suggested by which that which we recognise as purpose may come into actual operation as process. It is not simply the case that natural selection would be a suitable machinery for purpose to employ (as it can employ any machinery); but natural selection is actual purpose operating proleptically; it is that by which we see final causes exhibited as actual causes. It is precisely on this account that it appeared to provide, as nothing else could, an *alternative* for final causes. But here, as in so many instances of modern thought, alternatives which were once thought to be rivals and exclusive of one another are later recognised as the correlative sides of one reality.

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[1] "It is infinitely easy," wrote Semper (1879), "to form a fanciful idea as to how this or that fact may be hypothetically explained, and very little trouble is needed to imagine some process by which hypothetical fundamental causes—equally fanciful—may have led to the result which has been actually observed. But when we try to prove by experiment that this imaginary process of development is indeed the true and inevitable one, much time and laborious research are indispensable, and we find ourselves wrecked on insurmountable difficulties."—*The Natural Conditions of Existence as they Affect Animal Life.* English translation. Preface. Kegan Paul. International Scientific Series.

2. BACTERIA

'The circle of organisms'[1] includes as an important link the immense variety of bacterial life. Bacteria, which in many quarters are still supposed to be merely harmful, really contribute to the prosperity of other organisms a share which is every year known to be more important. It is almost a world of *symbiosis* which is revealed. Everywhere at least there is an approach to that closest association of organisms which, by virtue of difference in their methods of life, are able to live on each other's waste and contribute to each other's health. In particular, bacteria play a most important part in the food-cycle of the world. The links in this cycle, found in the power of green plants to form carbon compounds (by the action of chlorophyll) from the carbon dioxide thrown by organic waste into the air, are familiar to every one. The methods by which nitrogen is saved and kept in circulation were, till lately, much more obscure. Certain nitrogenous products of organic waste cannot be assimilated by plants—in the ordinary sense of the word plants. These products are chemically changed by the living processes of plant-life of another kind, namely bacterial life, into forms which green plants live on. Further, the facts formerly known seemed to point to the conclusion that a portion of nitrogen in the uncombined or free state must continually be lost into the air and out of the air.

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[1] See p. 23.

It is now known that the free nitrogen of the air penetrating the soil is 'captured,' brought into combinations and restored to the food-cycle by the combined action of leguminous plants and certain bacteria collected in nodules upon the legumes' rootlets. "In Germany one sees whole fields of Yellow Lupine grown for no other purpose than to be ploughed in and so enrich the soil for other crops." A short account of *Bacillus radicicola* will be found at the end of the chapter on bacteria in Scott's *Flowerless Plants,* quoted just now, and an interesting sketch of the functions of bacteria in many departments of life is given in *The Story of Germ Life,* by H. W. Conn (Newnes). See also Appendix B, p. 171.

In considering the rather newly observed activity of Bacteria in the circulation of Nitrogen, one must not forget their importance in the circulation of Carbon by the fermentation of carbohydrates.

APPENDIX B

SOME BOOKS

In the following lists will be found the titles, publishers, and prices of most of the books named in the text, and of a few others suggested by them.

I have been led to think it may be useful to give, in addition, sufficient reference to some other natural-history books in departments not glanced at in our Manual.

The list is not framed so as to give a balanced representation even of a few departments. Some interesting books are suggested which may encourage further reading; and I have tried to save readers the trouble of finding out the publisher and so forth.

The most famous and indispensable books are generally not mentioned, except for the sake of indicating a particular edition.

General Zoology.

Some knowledge of this is necessary in order to follow the arguments, for example, of Darwin. The *essence* of all or nearly all problems of descent may no doubt be studied in plants; but it is only in animal life that we get a full view of the possibilities of competition; and of course it is only here that we come on the track of man. An actual knowledge of living creatures is necessary to give a conception (1) of the *possibilities* of organic nature, and (2) of the immense *demand* which is made upon any principle of explanation.

As there is in this subject so large a number of books to choose from, it is useful to name one.

Zoology: An Elementary Text-Book. By A. E. Shipley and E. W. Macbride. "Cambridge Natural Science Manuals." Cambridge University Press, 1901. 10s. 6d.

This may lead on to the great Cambridge series.

The Cambridge Natural History. General Editors, S. F. Harmer and A. E. Shipley. London: Macmillan & Co. About 17s. each volume.

The volume on *Amphibia and Reptiles,* by Hans Gadow, marks the high level of this great work, and Beddard's *Mammalia* shows how a systematic work may retain much of the interest of a popular Natural History.

GENERAL BOTANY.

An Introduction to Structural Botany. By D. H. Scott. 2 vols. Vol. i., *Flowering Plants;* vol. ii., *Flowerless Plants* (referred to on page 164). A. & C. Black. 7s.

A Text-Book of Botany. By E. Strasburger and others. Translated from the German by H. C. Porter. Second edition, revised by W. H. Lang. 1903. Macmillan & Co. 18s. net.

MORPHOLOGICAL THEORY.

Origin of Species. By C. Darwin. Sixth edition, 1872. Murray. 7s. 6d.

Also a cheap issue of the same. Murray. 2s. 6d. and 1s.

Principles of Biology. By Herbert Spencer. 2 vols., 1898–99. Williams & Co. 36s.

The Origin of the Fittest. By E. D. Cope. 1887. Macmillan. 12s. 6d.

Darwin, and After Darwin. By G. J. Romanes. 3 vols., 1892–97. Longmans. 26s.

Darwiniana. By T. H. Huxley. *Collected Essays.* Vol. ii., 1893. Macmillan (Eversley Series), 4s. net.

Natural Selection. Darwinism. By A. R. Wallace. 1889. Macmillan. 9s. each.

Animal Life. By Karl Semper. 1881. Kegan Paul. 5s. (International Science Series.)

Darwinism and Lamarckism. By F. W. Hutton. 1899. Duckworth. 3s. 6d.

The Advancement of Science. By E. Ray Lankester. 1890. Macmillan. 10s. 6d.

The Effects of Use and Disuse. By W. Platt Ball. (Nature Series.) 1890. Macmillan. 3s. 6d.

The Colours of Animals. By E. B. Poulton. 1890. (International Scientific Series.) Kegan Paul. 5s.

Sexual Dimorphism in the Animal Kingdom. By J. T. Cunningham. 1900. Black. 12s. 6d.

Animal Coloration. By F. E. Beddard. 1892. Sonnenschein. 6s.

Colour in Nature. By M. I. Newbigin. 1898. Murray. 7s. 6d.

APOLOGETICS AND GENERAL THEORY OF EVOLUTION.

The Philosophical Basis of Evolution. By J. Croll. 1890. Stanford. 7s. 6d.

The Living Organism. By Alfred Earle. 1898. Macmillan. 6s.

Through Nature to God. By J. Fiske. 1900. Macmillan. (One book named out of many.)

Mind and Motion and Monism. By G. J. Romanes. 1895. Longmans. 5s. 6d.

Thoughts on Religion. By G. J. Romanes. 1895. Longmans. 4s. 6d.

Unity of Nature and (2) *Reign of Law.* By the Duke of Argyll. Murray. 12s. ; (2) 5s.

Science and Religion. By H. Calderwood. 1888. Macmillan. 5s.

Development and Evolution. By J. M. Baldwin. 1902. The Macmillan Co., 10s. 6d.

The First Things. By Rev. John Buchan. 1902. Blackwood. 5s.

The Conflict of Truth. By F. H. Capron. Hodder and Stoughton. 10s. 6d.

The Lesson of Evolution. By F. W. Hutton. London: Duckworth. 2s. 6d.

The Riddle of the Universe. By Ernst Haeckel. 1902. Watts. 6s.

Naturalism and Agnosticism. (Gifford Lectures.) 2 vols. New edit., 1903. Black. 18s.

Problems of Religion and Science. By Ven. J. Wilson. Macmillan. 6d.

The Grammar of Science. By Karl Pearson. A. & C. Black. 1900. 7s. 6d.

The Foundations of Belief. By A. J. Balfour. Eighth edition, with additional matter. 1901. Longmans.

Huxley's *Romanes Lecture,* 1893, first published at the Clarendon Press, is in vol. ix. of *Collected Essays.* Macmillan. 4s. net.

HEREDITY AND VARIATION.

Essays upon Heredity and Kindred Biological Problems. By A. Weismann. 2 vols., 1891–92. Oxford. 12s. 6d.

The Germ-plasm: A Theory of Heredity. By A. Weismann. (Contemporary Science Series.) 1893. Trans. by W. Scott. 6s.

Studies in the Theory of Descent. By A. Weismann. 1882. Sampson Low. 40s.

The Cell in Development and Inheritance. By E. B. Wilson. 2nd edit., 1900. The Macmillan Co., New York. 14s. (Colombia University Biological Series.)

Materials for the Study of Variation. By W. Bateson. 1894. Macmillan & Co. 21s.

Mendel's Principles of Heredity. A Defence by W. Bateson. 1902. Cambridge University Press. 4s.

Reports to the Evolution Committee of the Royal Society. Bateson & Sanders. 1902. Harrison. 10s.

Variation in Animals and Plants. By H. M. Vernon. 1903. Kegan Paul & Co. (International Scientific Series.) 5s.

Hereditary Genius. By Francis Galton. New edit. 1892. Macmillan. 7s.

The principles of Mendel and Bateson receive special attention and criticism in *Biometrika.* Cambridge University Press. 30s. per vol. 2 vols. published.

MENTAL EVOLUTION.

Mental Evolution in Animals. By G. J. Romanes. 1883. Kegan Paul. 12s.

Mental Evolution in Man. By G. J. Romanes. 1888. Kegan Paul. 14s.

Inquiry into Human Faculty and its Development. By Francis Galton. 1883. Macmillan. 16s.

Animal Life and Intelligence. By C. Lloyd Morgan. 1890. Arnold. 16s.

Animal Behaviour. By C. Lloyd Morgan. 1900. Arnold. 10s. 6d.

Habit and Instinct. By C. Lloyd Morgan. 1896. Arnold. 16s.

Mind in Evolution. By L. T. Hobhouse, 1902. Macmillan. 10s.

Instinct and Reason. By H. R. Marshall. 1898. Macmillan. 12s. 6d.

PSYCHOLOGY—INVESTIGATION OF PERSONALITY, ETC.

The Soul of a Christian. By F. Grainger. 1900. 6s.

Springs of Character. By A. T. Schofield. 1901. Hodder & Stoughton. 3s. 6d.

Human Personality, and its Survival of Bodily Death. By F. W. H. Myers. 1903. Longmans. 42s.

The Soul—A Study and an Argument. By David Syme. 1903. Macmillan. 4s. 6d.

If a general introduction to Psychology is required the following book may be consulted :—

A Text-Book of Psychology. By William James. 1892. Macmillan & Co. 7s.

SOCIETY AS AN ORGANISM.

Evolution by Atrophy in Biology and Sociology. By De Moor-Massart & Vander Velde. 1899. Kegan Paul. (International Scientific Series.) 5s.

BACTERIA.

The Story of Germ Life. By H. W. Conn. Newnes. 1s.

The Structure and Function of Bacteria. By A. Fischer. Eng. trans. 1900. Oxford University Press. 8s. 6d.

"Nitragin" and the Nodules of Leguminous Plants. By Maria Dawson. *Philosophical Transactions of the Royal Society.* Series B, vol. cxcii. pp. 1–28; vol. cxciii. pp. 51–67. London: Dulau. 1s. 6d. and 2s.

("Nitragin" is a pure culture on gelatine of bacteria from root-nodules, and is an article of commerce in Germany).

HISTORY OF BIOLOGICAL SCIENCE.

To Carus' *Geschichte der Zoologie,* Munchen, 1872 (Oldenbourg. 10s.), may be added—

From the Greeks to Darwin. By H. F. Osborn, Sc.D., New York. 1894. Macmillan & Co. Columbia University Biological Series I. 9s.

French translation of Carus. *Historie de la Zoologie.* 1880. Paris: Baillière et fils. 12s. 6d.

BIOGRAPHIES.

Life of Pasteur. By Réné Vallery-Radot. Translated from the French by Mrs. Devonshire. (2 vols., 1902. Westminster: Constable.) 32s.

Life and Letters of Charles Darwin. 3 vols., 1887. Murray. 36s. Also cheap edition, 2s. 6d. net.

More Letters of Charles Darwin. 2 vols., 1903. Murray. 32s.

Life and Correspondence of Louis Agassiz. 8vo, 1890. (Zoston.) London. 12s.

Lamarck: His Life and Work. By A. S. Packard. 1901. Longmans. 9s.

Life and Letters of T. H. Huxley. 2 vols. 1900. Macmillan. 30s. Also 3 vols., 1903. 12s.

BOOKS OF TRAVEL.

Perhaps hardly any reading so brings to one the right temper of scientific inquiry as that of great books of the travels of naturalists. A few out of many are named.

Journal of Researches into the Natural History and Geology of the Countries visited during the Voyage *of H.M.S. "Beagle."* By C. Darwin. New edit., 1890. Murray. 21s. Also 1897 edit. Routledge. 2s. 6d.[1]

Notes by a Naturalist on the "Challenger." By H. N. Moseley. 1879. Macmillan. 21s.

Voyage of the "Challenger." By C. W. Thomson. 2 vols., 1877. Macmillan. 45s.

Malay Archipelago: A Narrative of Travel. By A. R. Wallace. 2 vols., 1869. Macmillan. 24s.

Travels on the Amazon. By A. R. Wallace. Minerva Library. Ward, Lock. 2s.

The Naturalist in Nicaragua. By T. Belt. (A rare and most excellent book.) 1874. Murray. 12s.

The Naturalist on the River Amazons. By H. W. Bates. 2 vols., 1863. Murray. 28s.

The Naturalist in La Plata. By W. H. Hudson. 3rd edition, 1895. Chapman. 8s.

I add, rather out of order, names of books in two specially interesting departments.

GEOGRAPHICAL DISTRIBUTION.

(i.) Of Animals.

Geographical and Geological Distribution of Animals. By A. Heilprin. English translation. Kegan Paul. (International Science Series.) 5s.

Text Book of Zoogeography. By F. E. Beddard. (Cambridge Natural Science Manuals.) 1895. 6s.

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[1] (Darwin) Also in the Minerva Library. Ward Lock, & Co. 2s.

(ii.) Of Plants.

Plant Geography upon a Physiological Basis. By A. F. W. Schimper. English translation, by W. R. Fisher. Oxford University Press. Parts I. and II., 9s. each (to be completed in four parts).

PALÆONTOLOGY.

(i.) Of Animals.

Text Book of Palæontology. By K. A. Zittel. English translation, by C. R. Eastman. Macmillan. 2 vols. 35s.

Outlines of Vertebrate Palæontology for Students of Zoology. By A. S. Woodward. (Cambridge Natural Science Manuals.) 14s.

Elementary Palæontology of Invertebrates. By Henry Wood. (Cambridge Natural Science Manuals.) 1896. 6s.

(ii.) Of Plants.

Fossil Plants for Students of Botany and Geology. (Cambridge Natural Science Manuals.) 1898. 12s.

Fossil Botany. By H. G. zu Solms-Laubach. English translation, by H. E. F. Garnsey. 1891. Oxford University Press. 18s.

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"This is an admirable little guide-book to wide study by one who well knows how to guide. It is sound and learned, and crammed full of information, yet pleasant in style and easy to understand."—*Pall Mall Gazette.*

THE MINISTRY OF CONVERSION. By the Rev. A. J. MASON, D.D., Master of Pembroke College, Cambridge. *Second Impression.*

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THE FINAL PASSOVER: A Series of Meditations upon the Passion of our Lord Jesus Christ. *Small 8vo.*

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